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EDITORIAL

Temple lands for agricultural improvements. During the discussions which followed Mr. Anandan's paper on Rice crop in the Tanjore delta (published in our July issue), Rao Sahib Sri T. V. Rajagopalachariar stated that several temples and mutts in South India possess extensive areas of land running to several thousands of acres which are at present leased out to villages at nominal rents. He suggested that if agricultural graduates are either employed by the temple trusts or allowed to colonise on lands leased out to them under stipulated terms, the agriculture on these lands could be re-orientated in a manner beneficial both to the temples and the lessees. Mr. Anandan endorsed Mr. Rajagopalachariar's views and suggested that one of the most profitable avenues of utilizing such lands in the delta areas by agricultural graduates would be to inaugurate seed farms for the scientific multiplication of departmental strains of paddy to meet a need which is as urgent as it is important. As matters stand at present the agricultural research stations are not able to cope with the increasing demand for improved seed, especially in the case of paddy and the supply, in our opinion, is but an infinitesimal fraction of the total demand. The utilisation of temple lands for this purpose offers great possibilities, and we are assured by the Director of Agriculture that the authorities would take up the consideration of this matter immediately on hand. In the meanwhile, we would invite correspondence on the subject from such of our readers as are in a position to offer their remarks on this scheme.

The Indian Science Congress. Elsewhere in this issue we publish a letter from the Secretary of the Agricultural section of the Indian Science Congress inviting papers from the members of the Madras Agricultural Students' Union and other workers in the field of Agricultural science, for presenting at the ensuing session of the Congress in Madras. We commend this letter to the attention of our readers.

Agricultural propaganda and the cinema. A letter from a correspondent published elsewhere in this issue, suggests the utilisation of the cinema, as an aid to propaganda, in disseminating knowledge, amongst the cultivators. The idea is not a new one and was considered by the Royal Commission on Agriculture in India as one with immense possibilities. In fact, a beginning was made in Madras as early as 1933 and one or two films were made by the Research Engineer. Apparently for financial reasons much progress has not been made and in the meanwhile, the rapid progress of the 'talkie' has left the silent film far behind.

The making of a good propaganda picture is not an esay matter. Considerable fore-thought, a fertile imagination, a high degree of technical skill

and a deep insight into the ryots' mind are necessary before a successful picture is made. The propaganda film to be effective and useful should be of such a kind, as will not only stimulate the curiosity of the onlooker, but should enable him to retain in his mind, the visual impression, received on seeing the picture. The attempt is bound to fail if handled by amateurs. What is needed is a coordinated effort of highly skilled technicians on the one hand and the Agricultural and other departments on the other. After a good picture is made, arrangements should be made to have it exhibited as widely as possible in different parts of the province. The suggestion of our correspondent to utilise itinerant cinema companies as an agency for the exhibition of the films is worth considering. We have no intention to suggest details but the system of payment of a small fee for the service would save Government the capital outlay on cine projectors and other expensive commitments.

In making propaganda pictures, excellent use may be made of the technique of animated cartoons. For example, a series of animated cartoons, may with greater force bring to the mind of the cultivator the damage caused by the devastation of an insect pest or a fungus disease than mere matter-of-fact photographs. Now that the sound film has relegated the silent film to the background suitable dialogues have to be provided for the pictures. The question of dialogue bristles with difficulties in a multi-lingual area like the Madras presidency where the pictures have to be made in atleast four languages. But these difficulties are not insurmountable and can be overcome with adequate finance and organisation. In this connection we are of opinion that the making of such films is not without commercial possibilities. The following subjects, for example, lend themselves easily to pictorial representation (1) Bee keeping, (2) poultry rearing, (3) butter making, (4) horticultural practices like pruning, budding, grafting &c., (5) care and managemet of farm animals including silage making, (6) construction of rural buildings, (7) preservation of manures, (8) rural sanitation (9) malt making, (10) spraying, dusting and seed-dressing, (11) grading, storage and transport of fruit. The list is by no means an exhaustive one, but merely shows what a wide range of subjects await the camera-man. In themselves, such films may not draw crowds to the box office, but they, would form useful adjuncts to the usual recreation pictures. According to the latest review of foreign film markets issued by the Bureau of Foreign and Domestic Commerce of the United States "in India although the possibilities of cultural development through the medium of the film have definitely begun to be recognised, educational authorities have been slow in applying themselves seriously to the subject. The question is still simmering in their minds as to the practicability of this method of instruction. A good beginning has been made in parts of the country but the field is still virtually virgin for exploitation by *foreign films*". We hope this subject will receive the attention it deserves from the provincial Governments and the Imperial Council of Agricultural Research.

Sugar Industry in Madras.

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Introduction. In this paper an attempt is made to make a study of the present position and the possibilities of expansion of the sugar industry in India, in general, and in the Madras Presidency, in particular. The scope of this study will include the different phases of the industry, right from the cultivation stage of improved strains of cane, down to the marketing side of the finished products and bye-products. This has been undertaken to bring home to the sugarcane growers and other agriculturists, owning lands fit for sugarcane cultivation, the economic advantages of adopting modernised methods of cultivation, marketing of sugarcanes, the manufacture of jaggery and refining of sugar and the further treatment of the bye-products so as to increase their utility value. The view-points of the different interests involved—the cane ryots, the factory-owners, the merchants and lastly the consumers are duly considered.

Importance of the Industry. The phenomenal headway that this industry, has made within a space of ten years, and the beneficient parts played by it, in the agricultural, industrial and social economy of the country render it a fit subject for an intensive—and careful study.

Agricultural. Sugarcane is one of the domineering crops, with its annual value estimated at sixty crores of rupees and with a cultivation area of 3½ million acres out of the total 227 million acres for the whole of India.[1] The following table will further attest the importance given to this crop by the agriculturists.

TABLE I. Growth of Sugar Industry in India since 1931—32.

Year or season.	Acreage of sugar-crop in 1000 acres.	Improved variety acerage in 1000 acres.	Average cane production tons per acre.	No. of modern factories in working.	Quantity of cane crushed Tons.	Quantity of sugar produced (cane factory production only) Tons.	Average percentage of recovery of sugar in factories.
1931—32	3077	1170	14·1	32	1,783,000	158,581	8·89
1932—33	3425	1845	14·9	57	3,350,000	290,177	8·66
1933—34	3422	2295	15·3	112	5,157,000	453,965	8·80
1934—35	3602	2433	15·1	130	6,672,000	578,115	8·66
1935—36	4154	3056	15·3	137	9,801,000	932,100	9·29
1936—37*	4440	3461	15·6	137	11,687,000	1,111,400	9·50
1937—38	3869	3600	...	136	9,916,000	930,700	9·38

* Excluding Burma from 1936—37.

Industrial. The Sugarcane industry is second only to the cotton industry in importance. Where India had to depend, prior to 1929, for an import of no less than 9,32,000 tons[2] costing Rs 16 crores a year, to-day,

she is in a position not only to produce her total requirements of 10,00,000 tons[3] but also she has a surplus left available for export every year. From 27 factories in 1929[4] there are, today, about 140 factories[3] working in India, with an output of about 11 lakhs of tons, the import of foreign sugar having correspondingly gone down to 13,000 tons from 932,000 tons[2]. Again, out of the total world production of 30,991,000 tons of sugar in 1937-1938, India's contribution came to 5,205,000 tons or 17·0 of the total production, thus showing that she remains, to-day, the single largest sugar producing country in the world (vide Table II.)

TABLE II. World's production and consumption of Sugar in long tons and percentage basis for the year 1937–38.

	Production.	Percentage to world production.	Consumption.	Percentage to world consumption.
Total world (Long tons Raw)	30,991,000	...	29,757,000	...
North America (United States)	1,626,000	5·2	6,100,000	20·5
Total North America	7,931,000	25·6	7,279,000	24 5
Total South America	2,034,000	6·6	1,758,000	5 9
Europe—				
Germany	2,181,000	7·0	1,825,000	5·9
France	936,000	3·0	1,093,000	3·7
Russia	2,460,000	8·0	2,176,000	7·3
United Kingdom	414,000	1·3	2,340,000	7·9
Total Europe	9,624,000	31·5	11,324,000	38·1
Asia—				
China	380,000	1·2	700,000	2·7
India	5,275,000	17·0	5,275,000	17·7
Japanese Empire	1,270,000	4·1	1,118,000	3·8
Java	1,380,000	4·5	347,000	1·2
Philippines	983,000	3·2	85,000	0·3
Total Asia	9,318,000	30·0	8,092,000	27·3
Total of Africa	1,175,000	3·8	852,000	2·9
Total of Australia	765,000	2·5	393,000	1·3
Grand Total	30,991,000	100·0	29 757,000	100·0

Social. On the social side, this industry is responsible for putting a stop to the yearly drain of 16 crores of rupees out of India; again, it is to the credit of this industry that the vexed problem of unemployment that the Great War left as its legacy was solved in a measure, by bringing into its fold 2500 science graduates, and 100,000 un-skilled workers; besides, the interests of no less than 20 million cultivators are linked up with this industry. Yet another—effect of this industry, the importance of which cannot be exaggerated, is the investment of no less than a sum of 30 crores of Rupees in the venture, mostly by Indian capitalists.

Protective measures of Government and the progress of the industry. In the estimation of Sir T. Vijayaraghavachariar, all these achievements are rendered possible because of the protective tariff levied on imports of foreign sugar. Thanks, to the abandonment of the *laissez faire* policy, the Government of India, passed Act No. XIII of 1932 to provide " for the fostering and development of the Sugar Industry in British India". According to this an import duty of Rs. 7½ was levied on every cwt. of white sugar imported into India, together with a sur-charge of 25 per cent. making in all Rs. 9—1—0 per cwt.

TABLE III. Comparative growth of the Sugar Industry in the various provinces since 1931—1932.

Number of cane factories working.

Provinces	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
United Province	14	33	59	65	67	68	68
Bihar	12	19	33	34	35	33	33
Punjab	1	1	5	6	4	5	3
Madras	2	2	4	8	6	11	8
Bombay	2	1	4	5	6	6	7
Bengal	...	...	2	5	6	6	6
Orissa	...	...	...	...	...	...	2
Indian States	...	...	4	5	9	8	9
Burma	1	1	1	2	2	2	2
Total for India	32	57	112	130	137	137	136

U. P. and Bihar both have about 75% of total number of factories.
Burma included up-to 1935—36.
Burma excluded from 1936—37 from the total for India.

The progress made by the Industry (Vide Tables I to III) within a short period of two years following the grant of protection was described as "almost staggering" by the under secretary of State for India. This Act was followed by the Sugar (Excise duty) Act XIV of 1934 ", another all India Act, providing "for the imposition and collection of an excise duty on sugar" manufactured under factory conditions. According to this Act, an excise duty of 10 as. per cwt. (increased to Rs. 1 from 28—2—1937) for *Khandasari* sugar (mainly produced in the United Provinces) and Re. 1—5—0 per cwt. for all other sugars except palmyra sugar, the rate for which should be fixed by the Governor-General after an enquiry was made. The latter rate of Re. 1—5—0 per cwt. stands raised to Rs. 2—0—0 per cwt. from 28—2—'37. The year 1934 saw yet another All India Act passed—Act XV of 1934 called "Sugar-cane Act 1934", to regulate the price of sugar-cane intended for use in sugar factories. Section 3 of this Act empowers Governments to declare, after previous notification in the local gazette, any specified areas as controlled areas, and, by a similar process, to fix a minimum price for the purchase, in any controlled area, of sugarcane intended for use in any factory ; by further consequential sections, penalties for contravention of notifications were provided for. But it must be noted here that those Acts were only enabling measures, permitting only such of the local governments as are desirous of taking advantage of these provisions to do so. This

perhaps, explains the position why, barring United Provinces and Bihar, other Provinces, particularly our province, do not seem to have taken full advantage of these enactments ; so far as United Province and Bihar are concerned, they have reaped the full benefits of these measures, much to the general relief of the country and the growth of the industry, vide Table IV, IV-A and IV-B.

TABLE IV. Recovery percentage obtained in various provinces.

Provinces.	In 1937-38 recovery sugar per cent.	1938-39 recovery sugar per cent.	Cane crushed tons.	Sugar made tons.
United Provinces	9·18	9.21	4,169,000	384,000
Bihar	9·58	9 15	1,858,000	170,000
Punjab and Sind	8·40	8·48	124,900	10,000
Madras	9 47	9·42	288,500	27,200
Bombay	10·97	11·13	459,600	53,400
Bengal	8·89	8·00	233,700	18,700
Orissa	8·17	8·33	18,000	1,500
Indian States	9·81	9 85	924,400	91,100

TABLE IV A. Acreage and yield of sugarcane for all provinces in India during 1936—37 and 1937—38.

Provinces States.	Area (1000 acres)		Yield (1000 tons)		Yield per acre (lb.)	
	1937—38	1936—37	1937—38	1936—37	1937—38	1936—37
United Province including T. States. ...	2181	2515	3141	3802	3226	3386
Punjab ...	512	554	363	465	1558	1880
Bihar ...	342	460	356	493	2332	2401
Bengal ...	290	355	485	626	3731	3950
Madras ...	98	122	267	339	6103	6224
Bombay including Indian States ...	116	.130	284	316	5484	5445
North West Frontier Province ...	70	71	75	78	2400	2461
Assam ...	38	40	39	40	2299	2240
Central Provinces and Berar ...	33	32	50	51	3394	3570
Orissa ...	34	31	63	51	4151	3685
Delhi ...	6	5	2	6	747	2688
Sind ...	6	6	13	13	4853	4853
Hyderabad ...	30	58	60	124	4480	4789
Mysore ...	49	52	69	75	3154	3231
Bhopal (Central India) ...	7	6	6	6	1920	2240
Baroda ...	3	3	4	4	2987	2987
	3815	4440	5275	6489	52849	56030

TABLE IV B. Actual percentage of sugarcane area under various tracts to tota area under cane in India in 1937--38.

U. P.	57%	Bengal	8%
Punjab	13%	Bombay	3%
Bihar	9%	Madras	2%

Yet another step calculated to help the industry, taken by the Government of India, was the announcement made by its Finance Member, in his budget speech of 1934, that a portion of the excise duty on sugar, equivalent to 1 anna per cwt. would be set aside by the Government to serve as a fund which will be distributed among the provinces where white sugar is

produced, "for the purpose of assisting the organisation and operation of co-operative societies among the cane growers, so as to help them in securing fair prices or for other purposes directed to the same end." Here again, the United Provinces and Bihar were the first to take full advantage of the grant by formulating suitable schemes to work the grant-system details about which, however, will be given in appropriate places.

Action by The Bihar and The United Province Governments. In the actual working of the various Government of India Acts, both the United Provinces and Bihar felt the need for separate comprehensive measures, and, accordingly, (The Bihar Sugar Factories Control Act 1937 Bihar Act VII of 1937) and the United Provinces Sugar Factories control Act 1938 (Act I of 1938) were passed. The Bihar Act provided for (1) The licensing of sugar factories; (2) The regulation of the supply of sugarcane to factories: (3) The fixation of a minimum price for sugarcane; (4) The establishment of a sugar control board and advisory committees; and (5) The levy of a tax on the sale of sugar-cane intended for use in factories.

The United Provinces Act provided for the licensing of sugar factories and for regulating the supply of sugarcane, intended for use in such factories, and the price at which it may be purchased, and for such other matters as may be incidental thereto.

Both the Acts are to remain in force till 30th June, 1941 and both give prominence to sugar-cane growers' co-operative societies, the organisation of which was encouraged, for collectively obtaining the full benefits of planned activities. In the discharge of the executive functions, imposed by these statutes, advisory committees and sugar control boards were created.

TABLE V. Chief varieties of cane grown in the different provinces with special reference to Coimbatore. (Co) canes.

Name of Province	Name of variety	Percentage area to total cane area	Remarks
United Provinces	Co 213	60% } 90%	Dominated by Co canes,
	Co 290	6%	
	Co 240	6%	
	other Co canes	18%	
Bihar	Co 213		Universal
	Co 210		Close competitor to 213
	Co 299	90%	Early cane
	Co 313		Mid season cane
	Co 331		Late cane.
The Punjab	Indigenous canes	50%	
	other canes	50%	
Bengal	Co 213	80%	
Bombay	Pundia		Universal
	E. K. 2878		Replacing Pundia Gradually
	E. K. 28		
Madras	Indigenous canes		
	Co 413		Promising Coimbatore canes.
	Co 419		
	Co 421		
Mysore	H. M. 320		Mysore canes only Coimbatore canes not dominant.
	H. M. 544		
	H. M. 553		
	H. M 602		

On the non-official side, registered organisations, like the Indian Sugar Syndicate Ltd. other *ad hoc* committees and conferences and the Inter Provincial Sugar Control Board, in which both the provinces jointly participated also began to function.

Effects. The cumulative effects of the operation of these various forces resulted (1) in, the prevention of unhealthy competition, thus leading to the control of production of sugarcane, and sugar and the sale of sugar; (2) in the elimination of wastages in cane supplies to factories, by a proper regulation of its supply, in that factories were obliged to confine their purchases within the regional areas previously declared as controlled area; (3) in the scientific improvement of cane cultivation, with a view to increase the sucrose content of the cane and the introduction of early and late maturing varieties (vide Table I and IV).

Apart from the above benefits accruing to the immediate parties concerned, the following are some of the advantages that the country, as a whole, reaped: (1) The yearly drain of 16 crores out of the country

TABLE VI. Balance-sheets of Sugar companies and dividends since 1932.

Name of Company	Paid up capital with debentures	Net block	Dividend					
			1932	1933	1934	1935	1936	1937
	Rs.	Rs.						
Balarampur Sugar Co., Ltd.	28,00,000	29,64,640	...	...	10	10	10	3¾
Basti Sugar Mills, Ltd.	11,99,600	24,26,582	30	25	25	15	25	15
Belsund Sugar Co., Ltd.	20,49,950	18,55,000	...	...	Nil.	Nil.	Nil.	Nil.
Balapur Co., Ltd.	37,59,800	16.61 000	...	...	24	24	16	14
Bharat Sugar Mills, Ltd.	7,50,000	7,17,591	...	...	...	Nil	7½	10
Buland Sugar Co., Ltd.	18,00,000	20,43,471	...	...	...	...	5	6
Carew & Co., Ltd.	20,00,000	15,84,552	12½	15	15	12½	12½	10
Cawnpore Sugar Works, Ltd.	25,00,000	36,54,357	35	30	30	25	10	5
Champaran Sugar Co, Ltd.	14.62,000	25,67,785	15	15	5	10	20	5
Deccan Sugar & Abkhari Co., Ltd	15,30,003	9,19,556	...	20	30	35	20	10
East India Distilleries & Sugar Factories Ltd.	£ 321,881	£ 282,872	10	10	7½	10	10	5
Mysore Sugar Co., Ltd.	33,01,200	31,60,814	...	...	10	11¼	15	10
New Savan Sugar & Gur Refining Co., Ltd.	11,00,000	9,71,337	15	12½	10	Nil.	10	Nil.
New Swadeshi Sugar Mills Co., Ltd	11,25,000	11,45,000	...	...	6	6	7	...
Oudh Sugar Mills Ltd.	16 48,000	19,85,000	...	...	7	6	9	...
Punjab Sugar Mills Co., Ltd.	9,74,000	9,31,864	40	40	40	15	20	15
Purnea Sugar Co., Ltd.	18 00,000	13,13,390	...	...	Nil.	Nil.	Nil.	Nil.
Purtabpore Co., Ltd.	15,00,000	18,79 819	10	10	7½	Nil	7½	Nil.
Raya Sugar Co., Ltd.	15,00,000	17,63,285	...	...	5	6	10	7½
Ryam Sugar Ltd.	7,75,000	8,35,616	30	30	15	15	10	Nil.
Somastipur Central Sugar Co., Ltd.	15 99,000	12,26,441	10	12½	Nil.	Nil	Nil	Nil.
Shree Sitaram Sugar Co., Ltd.	10,95,462	12,94,453	...	...	....	6¾	Nil	10
Sitalpur Sugar Works Ltd.	12,35,175	18,77,701	...	...	6	Nil	8	Nil.
South Bihar Sugar Mills Ltd.	11,50,000	19,73,503	...	...	10	12½	15	15
Upper Ganges Sugar Mills Ltd.	11,99,950	17,02,000	...	...	Nil.	Nil.	5	7½

was prevented, thereby augmenting the income of agriculturists, labourers, unemployed science graduates etc. According to Sir T. Vijayaraghavachariar, half of the value of production went to the agriculturists as the cost

of cane and out of the balance, a good portion was paid as wages, salaries freights etc." (2) the acreage of sugar-cane cultivation was increased, much to the benefit of the ryots; (vide Table I) (3) A fair price was ensured to the consumer despite the tariff, due to lesser cost of production. Java sugar mostly competed with the Indian production and this forced the cutting down of prices of sugar even to the extent of some of the factories working at a loss—vide Table VI. (4) the budgetary position of the Government improved, as a result of the increasing revenue the Exchequer got both in the way of import tariff and excise duty Vide Table No. VII.

TABLE VII. Yield of revenue from import duty on sugar in India.

(Burma excluded from 1936--37).

Year.	Yield of Revenue. Import Rs.	Excise Rs.
1931—32	6,19,00,000	...
1932—33	6,84,00,000	...
1933—34	4,72,04,000	...
1934—35	3,81,35,000	97,22,000
1935—36	3,24,16,000	158,84,000
1936--37	43,87,000	252,49,000
1937—38	25,33,000	33,14,800

Figures for Burma excluded in 1936—37 and 1937—38.

(5) Enterprising capitalists mostly Indian, came forward to sink more and more of their capital in the floatation of new companies, thus belying the notion that Indian capital is notoriously shy—vide Table I & VI.

Further Requirements. The progress made by this industry is undoubtedly satisfactory as far as it goes; yet a study of the figures of production and consumption of sugar for the world, would show that there is still a greater scope to improve the industry. Table III would show that as the largest single producing country with its immense resources lying undeveloped, India can yet strive to capture the world monopoly of this industry. But alas! owing to the inexplicable change in the policy of protection adopted by the Government of India in 1937 which found expressions in the increase of excise duty and also by the Government of India becoming a party to an International Agreement, by which India has been prohibited from exporting sugar by sea elsewhere than to Burma up to 31st December 1941, and lastly in the reduction of 0—8—0 per cwt. in the import duty, the progress of the industry got arrested all along the line. The decline is noticeable not only in the loss sustained by many of the factories but even in the drop in the output; while the optimum point, as it were, has been reached, at any rate, in the two most progressive provinces, viz. U. P. and Behar—(vide Table I). One is reminded in this connection of the observation made by that well-known economist—Professor N. S. Subba Rao, in one of his lectures on "Economic Planning"[5] delivered under the auspices of the University of Madras.

"General opinion is in favour not only of state intervention but sustained state intervention, for two reasons (to quote one of the reasons) if there is to be intervention at all, *it should be continuous and not fitful or sporadic*, for industry can accustom itself to continuity of influence from the state, whereas fitful intervention without anything in the nature of a plan is calculated to be both ineffective and disturbing.........................." but the world at large is apprehensive of collaboration between businessmen, and is aware that Adam Smiths' well-known gibe at them is only too amply borne out by the respective policy of cartels and international agreements between producers."

Even though the agreement, under notice here, is between governments only, yet inasmuch as they concluded it only on behalf of producers but without their consents being obtained prior to the conclusion of the agreement and in fact in the teeth of opposition, its reactions are noticeable in two directions ; firstly, as already pointed out, in the all round decline of the industry and secondly in the creation of inter-provincial jealousy. In the name of a likely overproduction next year, Mr. M. P. Gandhi, the Editor of *Indian Sugar Industry Annual* 1938, put in a plea of restriction of sugarcane crop and sugar production for the coming year. This only roundly means that, as against the already established supremacy of this industry in the forward provinces, especially United Provinces and Behar other provinces working out an expansion programme have simply to cry 'halt' suddenly because, forsooth ! overproduction is feared. Fortunately or unfortunately, the Indian Syndicates forecast, as reported by 'Associated Special Service' dated Calcutta, 7—6—1939 says "the total production of sugar by cane crushing factories and *gur* refineries in India (including states) during the season 1938-1939, is 6,44,000 tons as against 9,47,000 tons during 1937-1938—a decrease of 3,03,000 tons approximately". Indeed, in the absence of any co-ordinating agency, acting in the interest of the whole of India we cannot escape such counsels.

Position of Madras. As it is, on account of a policy of inaction followed till lately by our Government, Madras occupies only the fourth rank (Vide. Table IV) in the productive strength, even though, it commands the ideal tropical climate eminently suited to push it on to the front rank. Mr. M. P Gandhi, is himself surprised at the domineering position occupied, in this respect, by the United Provinces and Bihar, inspite of their geographical position in subtropical climate. Our own surprise gets the more intense when it is considered that the crops yielding bumper yields in both these provinces are all of the Coimbatore varieties evolved in the Coimbatore Experimental Station. (Vide Table V). Enjoying, then, as it does, all the favourable natural facilities for attaining a leading position and having regard too, to the wide disparity obtaining between its production and consumption figures viz. 72,000 tons of consumption of sugar as against 34,000 tons of production, Madras Presidency has not any valid excuse to take rank as a bad fourth in the matter of production. There is only one reason for this state of affairs, as it appears to us. Madras has not so far been given or what means the same thing, has not taken, all the adventitious aids, official and non-official that were taken advantage of by the United Provinces and Bihar.

Barring a belated application of the All India act in declaring certain areas, as controlled and barring again the belated formation of co-operative organisations of sugarcane growers, the effect of which cannot appreciably be measured by any reliable statistics, one feels the eleven factories of the Presidency do not seem to make the best of the situation either for themselves or for their clientele. The mere organisation of sugarcane growers' societies does not mean much to the ryots or to the industry itself in the absence of any of the separate expert bodies operating as in the case of United Provinces and Bihar.

Needs of Madras. A separate Provincial Bill, more or less on the lines of the sugar control Acts of these provinces and a periodical fixation of minimum prices for sugar-cane seem to us to be the urgent needs of the time. Details as to the basis of fixing the rate, the several other ways of developing the industry to its full reach of possibilities in this presidency, the several disabilities and limitations facing the industry in the presidency and the means of getting over them—all these would be discussed in future.

Acknowledgment. For statistics I am largely indebted to Mr. M. P. Gandhi, auther of *The Indian Sugar Industry Annual.*

References.

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The Main Cause of Crop Failure in the Black Soil Tract of the Bellary District.

BY C. VIJAYARAGHAVAN

AND

V. PANDURANGA RAO, M. A. (Madras); M. Sc. (Nebr. U. S. A.)

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Introduction. The black soil tract of the Bellary district, which is subject to frequent crop failures has the lowest rainfall in the presidency. The major portion of the rain is received in sudden downpours. Half the rainfall of the year is obtained between August and October and it rarely rains after the staple crops are sown. The undulating nature of the land, the high clay proportion (58%) in the soil and the sudden, heavy downpours—all contribute to the impoverishment of the land and to the low absorption of water in the soil, consequent on heavy losses by run-off. As rains are rarely received during the growing period of crops, the plants have to depend mainly on the moisture retained by the heavy clay soils. The huge losses of water due to evaporation from the surface of the soil coupled with that due to transpiration of the young shoots, desiccate the top soil quickly. As a consequence there is a shrinkage of the soil and a very

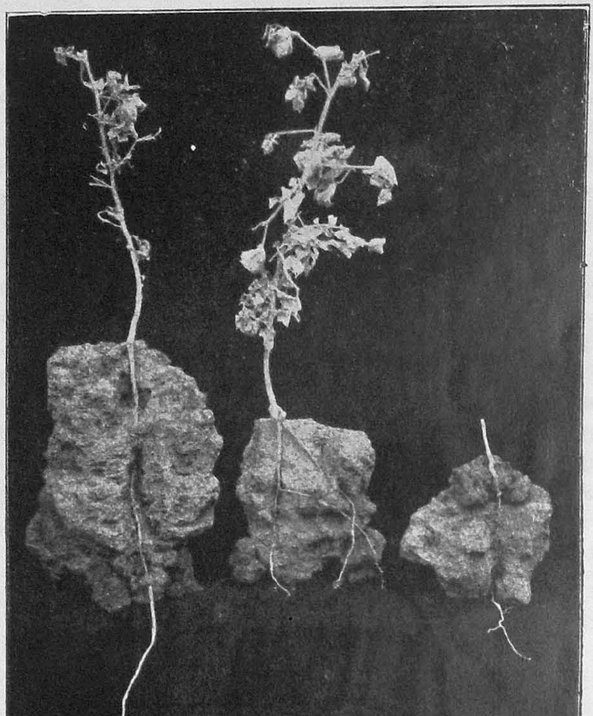
hard layer, 6" – 9" thick, develops below the top 2 inches of loose, friable soil layer. This hard layer affects crop growth as described below.

Moisture, the determining factor. Moisture seems to be the controlling factor in determining the occurrence of the hard layer. When the moisture level goes down below 10 per cent. in the top soil, the hard layer is formed. This layer is so hard that it is difficult to work a plough in it. It is slightly lighter in colour and stands out prominently in any soil profile. That it is chiefly the result of physical processes, viz., drying out of the soil, is demonstrated by the fact that the hard layer disappears when the soil moisture is increased by natural or artificial rain. By drying out a moist soil near field capacity (with the aid of trenches a foot deep dug on either side) it has been possible to induce the development of the hard layer.

How the hard layer affects the roots of crops. In the early stages of the crop, either in sorghum or Setaria, the seedling depends for its nourishment on the seminal root and one or two adventitious roots. When grown up, the plant is entirely dependent on the numerous adventitious roots that arise from the basal nodes of the shoot. These roots, which are so essential to the growing plant, are unable to pierce this hard layer and dry up in various levels developing a purple colour. Instead of penetrating into the soil, they trail along the surface, developing short, stubby root-ends. All types of abnormalities are noticed in the roots in their efforts at effecting an entry into and through the hard layer. What little growth there may be in the shoot, is due to the nutrients derived from the seminal root and the few adventitious roots that have already ramified in the deeper moist layers before the top layer hardened.

An interesting feature noticed in the nodal roots (in sorghum) which could not penetrate the hard layer is the development of innumerable root-hairs all over their surface giving them a silvery, woolly look. Normally in sorghum, the aerial adventitious roots are devoid of root-hairs. Root-hairs develop only when the roots pierce the ground and come in contact with moist particles of the soil. The occurrence of root-hairs all over the entire root, which is aerial, is rare. The root-hairs are healthy and full of protoplasmic contents. The disposition of the root-hairs on these aerial roots lends support for the suggestion that they are developed there in response to moisture which is furnished by the dew of the early hours of the mornings of November—December. This unusual development of root-hairs strongly suggests the extreme efforts on the part of the plant at obtaining water which it badly needs in a dry season (1938).

Even deep tap-rooted plants, like cotton, suffer. The soil, as it hardens, strangulates the tap-root encased in the hard layer with the result that the root region above the hard layer enlarges into a swollen, calloused base (Plate). The root below the hard layer is normal. The degree of hardening of soil seems to vary as is evidenced by the differences in thickness of the strangulated tap-root in the hard layer. Cotton plants may be severely stunted or even killed when their roots are choked in the hard zone.



Constriction of the tap-root of Cotton plants in the hard layer.

That this ecological disorder is purely mechanical is demonstrated by producing these abnormalities artificially. This was done by enclosing the root between two thick metal plates and screwing them up tightly. When pressure was applied to tap-roots for 25 days before the flowering phase, it was found that the growth rate of the shoot in the experimental plants was reduced to a fourth of that of the un-treated. As the plant grew, the stalk bulged out over the treated portion and formed an enlarged, calloused base. The structural deformities noticed in the exprerimental plants were similar to those of the affected plants in the field. When this pressure was applied in the late flowering stages for a similar period as before, no appreciable reduction in stem growth was seen. Nor did the stalk develop the enlarged, calloused base, though the treated portion of the root was strangulated into a flat structure. It has also been possible to induce constriction in roots of cotton plants by artificially drying out the top soil by digging trenches on either side of the plants. All these observations go to prove that the causal factors are purely mechanical.

The inception of the hard layer: The inception of the hard layer depends upon the amount and distribution of rainfall in any reason. If the rains are deficient the hard layer is ushered in very early in the life cycle of the plant. Then it effectively stops the penetration of roots or strangulates them destroying the tissues of the root. In seasons of good rainfall, the hard layer occurs only late in the season when the crops are nearing maturity. It does not affect crops in this stage, as the rootsystem is well developed and established in the deeper moist soil. Together with the development of wide cracks, the occurrence of the hard layer probably hastens the ripening of the crop. The deterioration of normal plants into earless plants—locally known as *Jadu choppa*—is also due to the presence of the hard layer. It has to be remembered that the occurrence of a hard layer is a normal phenomenon in the black soils of this tract. Under favourable conditions the farmer need not worry about it as it occurs only in the very late stages when the crop is well established but if it occurs in the young stages of crops, as in years of scarcity, he has to dread it most, as it involves serious consequences.

Remedy. So the chief concern in Dry Farming research in this tract is to eliminate this hard layer. Though bunding and following, which conserve moisture in the soil, may ease the situation a little by postponing the formation of the hard layer, other cultural methods which destroy it have to be devised. From the plant end, this trouble can be circumvented by producing a plant which develops an efficient root-system fairly quickly so that it has an elaborate root-system in the deeper zones of the soil before the formation of the hard layer in the top soil. To meet this end, short duration economic varieties have to be produced. An attempt in this direction has already been made by crossing the early and economic varieties of U. S. A., the *Milo* and *Wonder* with local sorghums. F_1 plants have been produced. Early, economic strains satisfying the above conditions will be developed from the progenies of these crosses. But in any

efficient handling of the situation, this problem has to be tackled from both the plant and soil end.

Summary. The crops fail in the Bellary tract due to the formation of a very hard layer 6″—9″ in thickness below the top 2″ of friable, loose soil, which cuts off the available moisture in the deeper layers. This hard layer prevents the later formed adventitious roots, which are so essential to growing cereals, from penetrating into the deeper moist layers of the soil or strangulates the tap root at the base of the stem in dicotyledonous plants, interfering with the translocation of water and nutrients to the shoot, which results in reduced growth or complete wilting of the plant. The inception of the hard layer depends upon the amount and distribution of rainfall in any season. In dry years it forms very early in the life history of the crop due to the depletion of the moisture in the top soil by evaporation and transpiration and, in such seasons, the crops completely fail. In favourable years it forms towards the later stages of the plant and hastens the maturity of the crop by reducing the water supply. This hastening of maturity is further helped by the tearing up of lateral roots during the development of cracks. Evolution of short duration varieties which form an elaborate root-system sufficiently early so that they can circumvent the hard layer, when it forms, is suggested.

Acknowledgment. This work could not have been undertaken but for the generous financial aid of the Imperial Council of Agricultural Research, to whom our thanks are due.

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The Cultivation of Cambodia Cotton in the Central Districts.

BY A. KANNAYYA, B. A., B. L.,
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In most parts of the central districts of Nellore, Chittoor, Chingleput and the two Arcots, (South and North), the ryot usually raises on his wet land a dry crop of *ragi* or *cumbu* or *cholam* during the *Puvvasi* season, (June—August), followed by a crop of paddy during the *Samba* season (September—January). In case he does not raise a dry crop during the *Puvvasi* season, he raises a crop of *Swaranavari* paddy, followed by a late *Samba* paddy during the *Samba* season. The raising of the *Swarnavari* crop depends upon a copious and unfailing supply of water from his wells. Raising of two paddy crops is an exception, rather than the rule.

In garden and dry lands, which go by the name of *Thottakkal* and *Punja*, two dry crops are raised in a year depending upon the resources of the ryots and wells at their disposal—normally a groundnut crop, and another crop of *ragi*, *cumbu* or *cholam*. On *Manavari* lands, which depend mainly on rain-water, he could raise only one crop such as horsegram, or rainfed groundnuts.

From the foregoing account of the main crops raised in this tract, it is evident that "money crops" are conspicuous by their absence, and the only crop that can be called as such is the groundnut. The ryot has to depend only on this crop, to pay the heavy assessment on his lands, to clear his debts, to celebrate the marriage of his sons and daughters, to purchase his agricultural implements, and clothings for the members of his household and incur other miscellaneous expenses.

Let us contrast the cropping scheme of the ryot of the central districts, with that of his *confrere* in the cotton growing tracts of Coimbatore. In addition to the crops which are raised in these parts, the Coimbatore ryot raises other crops, which will give him more money, and to this end, he so divides his land, and time, that he in addition to growing paddy, *ragi, cumbu* and *cholam*, makes it a point to grow some of the money crops like cotton, chillies and tobacco. During my visits to the Coimbatore district, what struck me most was the presence of at least one of the "money crops" in the holdings of every ryot, even of moderate means. I have heard of instances where one ryot near Coimbatore is normally making in the neighbourhood of Rs. 20,000 every alternative year, by growing cotton alone and Rs. 12,000 from tobacco. And it is no wonder, that the Coimbatore ryot after he has taken to money crops, especially cotton, is economically better off than our ryots, who depend mainly on paddy, groundnut, and *ragi* for their income. In passing it may be stated, that the Coimbatore ryot, works under a great handicap, viz., baling out water from wells which are 40 to 50 feet deep, the construction of the well itself costing him Rs. 2500 to 7000.

It strikes me that the best and easiest way to improve the economic condition of our ryots, is to copy the example of the Coimbatore ryot, and cultivate some of the money crops like cotton, chillies and tobacco, depending upon the facilities at their command. Of the above named crops, Cambodia cotton, as will be explained below, can be successfully raised by our ryots.

Varieties of cotton. There are many varieties of cotton grown in the southern part of our presidency, viz. *Cambodia, Uppam, Nadam* and *Karunganni.* Cambodia cotton is undoubtedly the best of all the above. The yield is greater and the cotton, being capable of producing yarn of a good quality, and of higher counts suitable for weaving cloths of fine varieties, commands a higher price than any other variety. While 1000 lbs of cotton kapas of other varieties except Karunganni yield 250 lbs. of lint, 1000 lbs. of Cambodia kapas yield 330 lbs. of lint, an increase of nearly 25%.

Is it difficult to grow? Being a new crop, the ryot who is generally conservative by nature, relying on age-long practices, and tradition of the village, handed down to him from his ancestors, may have a lurking fear that raising of Cambodia cotton requires a highly technical knowledge. But this is not so. The cultural operations for cotton are the same as those for *ragi* or *cumbu*, and the ryot can, without any extra knowledge or trouble,

raise a high-yielding crop of cotton. What are required for the raising of this crop are the same old bulls, which he is maintaining; the usual kind of ploughing, and inter-cultivation; but the only difference lies in harvesting, and nothing more, except a possible scare, that it is a new crop. He may have another legitimate fear, that the raising of the cotton crop, may result in the dislocation of his cropping scheme and rotation of crops. On garden lands, cotton takes the place of the crops grown during the period, September to April, and as such he can easily arrange his cropping scheme. Cotton is normally a eight months crop, and after cotton is harvested in April another crop of *ragi* or *cumbu* or some other crop can be raised in June—August season, in case he is particular of two crops.

Is it profitable? Another point, probably the most important point, on which the ryot would like to be fully enlightened, without the least shadow of a doubt, is the financial aspect. Is it more profitable to raise this crop in preference to paddy, *ragi, cumbu* or groundnut? It may be stated at the outset, that the average yield of paddy from one acre of land is about 15 bags (1000 *Madras measures*) giving a gross income of Rs. 75, the income from *ragi* is about Rs. 60, from *cumbu* about Rs. 50, and Rs. 70 from groundnuts. In the case of Cambodia cotton, the yield from one acre of medium fertility, will be about 1250 lb., giving a gross income of Rs. 125 at the lowest possible market rate, while highly fertile lands will yield anywhere from 1500 to 2000 lbs. giving an income of Rs. 150 to Rs. 200. At the present unfavourable market rate of Rs. 28 per *pothi* of 280 lbs., the income can be estimated at Rs. 125 per acre, the normal rate being in the neighbourhood of Rs. 32 per *pothi.*

A perusal of the comparative statements given in the appendix, showing the cost of cultivation of different crops and their yields, will clearly demonstrate that in the case of cotton, a net income of Rs. 90 per acre can safely be expected, excluding the cost of dried cotton stalks while the income from the other crops are even less than half in most cases.

In Government lands, the rent charged is the same irrespective of the crops raised, but in *zamindary* areas, which occupy half the total area of our parts, the rate for paddy is about Rs. 25 per acre, while the rate for cotton will be on a par with *ragi* and other pulse crops in the neighbourhood of Rs. 5 per acre.

On an average, an acre of cotton stalks, will produce firewood, weighing about 4 tons, or roughly 160 headloads. The cost of a headload of Casuarina is about 5 annas, and cotton firewood can be sold at 2 annas per headload, thus giving an additional income of Rs. 20 per acre. The dung that is now converted into cakes and used as fuel, can profitably be replaced by cotton stalks, and thus increase the available supply of farm-yard manure. Cotton stalks from one acre will supply firewood for a family of five persons for five months.

Irrigation. While copious and continued irrigations are required for garden land paddy, and at least eight irrigations for *ragi* and irrigated

groundnuts, only seven irrigations are required under normal conditions for cotton. Under the worst seasonal conditions, ten irrigations will be sufficient for the crop.

Where a well can command 2 acres of paddy and 3 acres of garden crop, 10 to 12 acres of cotton can be raised with the available quantity of water from the very same well.

The shedding of leaves from the cotton plants result in increasing the fertility of the land, while the raising of crops like paddy etc., have the effect of removing the fertility of the land. In the latter case, there is no return of manure back to the land while in the former case there is addition, and the decaying leaves, increase the humus content of the soil.

Trial of Cotton. At the instance of the Madras Agricultural Department, the writer grew Cambodia cotton in his fields at Nagari, Chittoor district, in a plot of 1¼ acres in the year 1936. Unfortunately, in spite of the advice of the departmental officers, a low-lying plot was selected half of which was subject to waterlogging, during the North East monsoon rains, with the result that intercultivations could not be done in that portion till the end of November. This was responsible for the stunted growth of the plants, and the local ryots were of opinion that it was only a ten-anna crop. Owing to the very favourable price then obtaining Rs. 36 per *pothi* of 280 lbs. a net income of Rs. 140 was realised. In subsequent years owing to the fall in the price of cotton (Rs. 28 per *pothi*) the writer was able to realise a net income of Rs. 90 to 100 per acre, depending upon the market price of the commodity. The average yield per acre was in the neighbourhood of 1250 lb. The ryots were so much convinced about the income from cotton that about 30 to 40 acres are now under cotton round about our village and in our taluk. They are definitely of opinion, that it is certainly very profitable to grow *cotton*, in the place of *groundnut, cumbu* or *ragi*. The joy of a poor ryot who realised Rs. 150 from his 1½ acres of land knew no bounds. Another ryot, who sowed cotton in 3⅓ acres at the end of September 1938, has so far realised Rs. 320 out of 2 pickings and the third picking is expected to give him at least another Rs. 100.

The growing of a new crop was too much for the ryots and specially to my father, a born businessman, who by training and habit, always thinks in terms of Rupees, annas and pies. I turned a rebel and sowed cotton. He would not and others too would not look at the crop. But lo ! what a change after 9 months. A money order for a lump sum delivered straight into his hands from the Tiruppur cotton trading society took him by surprise. Cotton is something of a wonder now. More than Rs. 100 from an acre ! The businessman in him, now asserted itself. He wants now not one acre under cotton but at least 10 acres yearly. That is the magic which cotton has played on him and I fondly hope that its spell would convert others too.

Appeal to the Ryot. The economic salvation of the ryot depends upon the help that he may receive from outside against and upon his own efforts. The formation of the Debt Conciliation boards, the starting of Loan

and Sale Societies and the Land Mortgage Banks, the passing of the Debt Relief Acts, intended to alleviate the distress of the ryot, come under the first category. But adopting the suggestions of the Agricultural Department, by using improved implements, and cultural operations, raising crops of approved and better strains, and growing money crops like chillies, tobacco, cotton, sugarcane, and plantains, depend upon his own actions. The help of outside agencies may indirectly help the ryot, but the enrichment of his family and the improvement of his financial status are the result of his own actions, and should he take to Cambodia cotton, it is bound to revolutionise his economic position. For there is no crop which is so easy to grow, and there is no crop which can give him, as much money as cotton can give him, barring of course sugarcane and plantains. While a lot of capital outlay and forty irrigations are required for raising sugarcane, not to speak of constant attention for one full year, and while the yield of plantains depends upon the absence of winds, and a constant supply of water, with a good initial investment for suckers and heavy manuring, cotton alone is unique in that with a capital of 8 annas it can be grown successfully even by a layman like myself, who took to it more as a hobby than as a profession. If the possibilities are so very great under the hands of a novice, much more will be the economic benefit if a practical agriculturist were to become its votary. Raising an acre of Cambodia cotton, is as good as insuring oneself for an income of Rs. 100 per annum, and such a steady annual income is bound to revolutionise his economic position. If you want to clear your debts, raise cotton ; if you desire to free yourself from the clutches of your village sowcar, grow cotton. If you wish to provide for your descendants, grow cotton. If you like to celebrate the marriage of your sons and daughters, without borrowing, grow cotton. If you want two square meals a day, and enjoy the fruits of your hard labour and lead a contented life, grow cotton. If there is a *Kamadhenu* on earth it is cotton and cotton alone.

In passing, it may be observed, that before taking to cotton, the Coimbatore ryot was as good or as bad as our ryots. But the growing of cotton gave him sufficient money to clear his debts, and as cotton was responsible to free him from the jaws of his *Marvadi* creditors, the Coimbatore ryot very pertinently christened cambodia cotton as *Marvadi Paruthi*. Similarly during the boom period, the growing of groundnuts enabled the South Arcot ryot to discharge his debts.

In the course of this paper, the experience of the writer has been given and it is his considered opinion that the growing of cotton yields from 100 to 25% more income than from the other crops.

Here is a golden opportunity for educated unemployed youngmen to woo and cajole "Mother Earth" and it is fervently hoped that this paper will greatly enable them to earn a decent income not only for their maintenance, but to improve the economic condition of their families. In these difficult days, it is an herculean effort to secure a job, and improved agriculture on modern lines offers the best possibilities provided the knowledge

gained in the research stations and the advice of the Agricultural department are utilised by our young men. Among God's gifts cotton offers unbounded scope for profit and pleasure.

APPENDIX I. Statement showing the cost of cultivation of crops

Operations.	Ragi.	Cumbu.	Groundnut.	Paddy.	Cotton.
Ploughing	4 8 0	3 0 0	3 12 0	6 0 0	4 8 0
Manuring	7 8 0	4 0 0	4 0 0	7 8 0	7 8 0
Seeds & seedlings	2 0 0	1 8 0	6 0 0	6 0 0	0 8 0
Hoeing & weeding	1 8 0	1 8 0	1 8 0	1 8 0	5 0 0*
Transplanting or sowing	2 0 0	1 0 0	0 12 0	3 0 0	0 8 0
Irrigation	10 0 0	6 0 0	5 0 0	5 0 0†	8 4 0
Harvesting & threshing	2 8 0	2 8 0	12 0 0	4 0 0	7 8 0
Rent	3 8 0	3 8 0	7 0 0	25 0 0	5 0 0
Marketing charges	...	...	...	...	6 4 0‡
Total	33 8 0	23 0 0	40 0 0	58 0 0	45 0 0

* If bullock power *Guntaka* are used, the cost will be only Rs. 2

† Rs. 5 represents only the wages of the cooly for the whole season for attending to irrigation.

‡ Represent the freight charges for sending cotton to Tiruppur.

APPENDIX II. Statement showing net income.

Crop.	Yield.	Value of Grains.	Value of Straw.	Expenditure.	Net Income.
Ragi	12 bags	60 0 0	7 8 0	33 8 0	34 0 0
Cumbu	10 bags	50 0 0	5 0 0	23 0 0	32 0 0
Groundnut	32 bags	70 0 0	7 8 0	40 0 0	37 8 0
Paddy	15 bags	75 0 0	15 0 0	58 0 0	32 0 0
Cotton	1250 lbs.	125 0 0	20 0 0	45 0 0	100 0 0

Each bag contains 60 *Madras measures.*

APPENDIX III. Net gain from cotton over other crops.

	Income from other crops.	Income from cotton.	Difference in favour of cotton.
Ragi	34 0 0	100 0 0	66 0 0
Cumbu	32 0 0	100 0 0	68 0 0
Groundnut	37 8 0	100 0 0	62 0 0
Paddy	32 0 0	100 0 0	68 0 0

SELECTED ARTICLE

A New Method in Mango Propagation.

By TYOZABURD TANAKA,

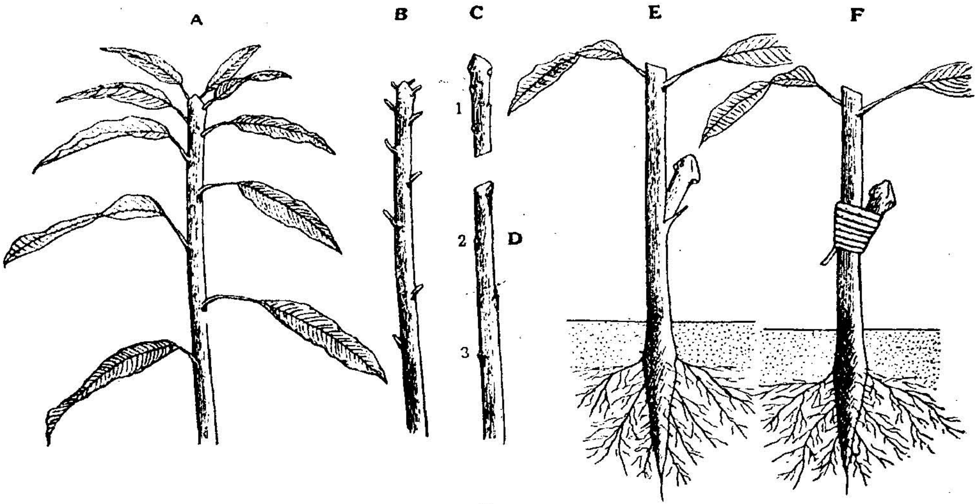
Taihaku Imperial University.

Introduction. Evergreen fruit trees, like the mango, citrus, chico, and avocado, are generally propagated by inarching and marcotting in warm countries, as it is believed that both budding and veneer grafting are not successful in the tropics. The reason is mainly based upon the fact that in cold countries one can easily utilize dormant buds which can be revived by placing them upon a functioning root stock, while in warm territories it is difficult for the budwood to harden and also the scion or buds used easily dry up with excessive heat before they become

firmly established in the process of union with the tissue of the root stock. Both inarching and marcotting, besides being tedious, cannot be expected to produce a large number of vigorous young plants at one time. The resulting offspring, besides being too large to be moved, thus exposing them to the danger of withering, are always weak and look old. Various methods of twig grafting have been claimed to be more satisfactory. One method is to use the whip grafted scion with a free bottom end nourished by water in tube, or inserted into moist soil. This method undoubtedly keeps the bud alive during a period long enough to perfect the union, but it requires too much labour. "Etiolation layering" is sometimes recommended to secure a large number of vigorous young plants in the tropics, but it is not always successful when the soil and temperature are not ideal. Under this circumstance, a new device for side-grafting in which immature wood is used, is proposed by Ichizo Nakamura of Takao, Formosa. This device works very satisfactorily under tropical conditions in multiplying mango plants in a very speedy way. This new finding is described in the following paragraphs.

Theoretical starting point. In temperate countries where both budding and grafting are practised the scion species used are mostly deciduous and the buds are dormant when cut, as those on immature wood are hard to revive. In tropical countries, in the case of the mango, the development of the bud does not require a long period of dormancy, and soft wood buds can be used for grafting purposes. Moreover, the healing of the wound is much easier when the plant is active in midsummer up to early fall when the temperature is high and the regenerative power is strong. In early spring the temperature is not high and the plant is more dormant than in summer and this gives a different effect to the plant. The root stock to be worked is also larger and more vigorous with the advance of the season and it is easy to force the bud to start strong growth. This supports the theory that spring is not the proper season when to practise grafting in the tropics, since the physiological and morphological conditions of the stock plant are, in summer rather than in spring, far more conducive to make the wound heal faster, force the inserted bud to grow easier, and complete the elongation of the shoot faster. It does not require an entire season to expect a full wood growth, as the growing season is long and the temperature favours a rapid elongation. Another important difference is the evaporation power. Ordinary scions used in the temperate countries in spring are dormant and keep a considerable length of time without losing their power of regeneration as the physiological activity is slow. Scions used in the tropics, on the other hand, are always active and ready to function even during winter, and are ever subject to loss of water by transpiration and respiration. Under this condition, the scion must be properly protected against loss of water, and the budwood must be waterproof as far as possible. To answer this requirement, budwoods must have neither foliage nor petiole, and the leaf scar should be water-tight with complete cork formation after the natural abscission of the petiole. This can be attained by removing the leaf blade at the middle of the petiole, before the scion is cut, and by waiting a week or so, the remaining petiole falls down with the formation of an abscission cork layer. Such wood is ready to be used as a scion. Without doing this, and if the leaves are removed at the time when the scion is cut, the cut surface of the petiole is likely to form a danger point, from which water may evaporate very quickly. Such scion will wither very rapidly and will not survive at all when used. Defoliation and healing of the leaf scar will unquestionably prevent the loss of water by the bud. Not only that. They accelerate the subsequent development of the bud into a sprout. The precuring of bud by defoliation renders the scion ready to start bud growth when used. This point is well explained in Mr. Nakamura's method and the factors which

A NEW METHOD IN MANGO PROPAGATION



Courtesy—Philippine Journal of Agriculture.

Explanation to Illustrations.

A, typical mango budwood.

B, leaves are removed by cutting them off at the petiole.

C and D, natural abscission of the remaining petioles. 1, 2, 3, pieces available for scion. They are to be cut off from the top at intervals of about two weeks, as soon as the cut surface is healed.

E, side grafting on a root stock cut back.

F, the same, tied with narrow thread tape.

cause the failure of grafting in the tropics are wisely avoided and more logical processes substituted.

Method of grafting. In Mr. Nakamura's method, terminal or lateral buds, in an intermittent rest period between two cyclic growths, are to be used. If the terminal bud is wanted several leaves from the top are removed and the scion with two or three leaf scars is to be cut after the abscission of the petiole. The lower portion of the same stick can be used again, after two weeks or so, in the meantime waiting for the terminal cut to heal completely. After removing the leaf blade and the remaining petiole, the top part with several leaf scars can be used, as before, for the scion. This time, the axillary buds in the uppermost position are to be developed. In a similar way, the still lower part of the same stock is available. It is better to remove all leaves of the entire shoot at the beginning, if several scions are to be obtained from the same shoot.

The scion is inserted into the notch made on one side of the immature but fully developed root stock, while the bark is still green. Two or three year old stocks with brown barks are also available but they are not so good as the green ones. Still larger stocks over two centimeters in diameter should be cut back when worked on with young sprouts. When the stock is old and top working is desired, the entire trunk is cut down in early spring at a point 15 to 18 cm. from the ground. From several adventitious sprouts arising near the cut surface, one or two opposite, strong, shoots may be saved, and such vigorous shoots are used when they grow big enough to work on. It does not matter how big the stock is, but the part to work on must not be fully mature and dormant. When working on young plants, the stock is cut at a point 5 to 10 cm. from the ground leaving two or three leaves, which are left untouched when the scion is inserted.

The root stock. The most economic and speedy way is to use one-year old mango fruits, chosen to supply seed for stock, must be large enough in size if the plant is a seedling type, and it must represent a good early strain. It is not necessary to use the seeds of big varieties, like the *Carabao* or *Golek*, because all seedling types supply good stock plant for the standard mangoes. If the *Carabao* mango seedling is used as the root stock of the *White Golek*, the scion will always outgrow the stock, but the stock of the seedling type of the mango will grow just as big as the scion or will slightly outgrow it. The seeds are planted in pots or in the ground 60 cm. apart, after removing the shell. The planting soil must be well prepared and rich in organic matter. After sowing the seeds, it is desirable to have a thin sand dressing on the surface. Upon germination of the seeds, they must be tested to show only a single plant from each seed, and smaller poly-embryonic secondary sprouts must be scraped off while they are young. The seedlings should be well fertilized to allow them to attain their maximum height and girth. In starting the work, the bigger seedlings are to be worked on first, the smaller ones next. The cutting back of the top of the stock must not be carried down too far away from the parts having closer leaf stand. In top-working old seedlings, the best results may be obtained when the plant is rather large, having at least a diameter of 12 to 15 cm. That transplanting may be made easier the seed should be planted in a longitudinally halved pot.

Operation and tying. The bottom of the scion must be cut very sharply to make an acute wedge, but one side must be cut along the cambial layer as far as possible, so that both sides are not asymmetrical. The cut surface must be very smooth, allowing a single draw of the knife to make an even plane. The stock is then notched by cutting it down diagonally, and the knife must be drawn straight down to make the oblique cut very sharp and even. The side to be incised must be as straight as possible. Curves should be avoided. It is preferable to work on the eastern side, as the after-noon sun may injure the graft

when it is done on the western side. The wood tissue should not be cut too deep into and incision must not be too far away from the cambial layer. The scion wedge to be well placed must be inserted in air-tight contact with the incision surface. The tongue-like portion of the bark must not be broader than the stock notch, even if the scion is thicker than the stock. In other words, the cambial plane of the former must be completely concealed within the incision of the stock. All precaution must be taken to make the scion wound perfectly covered by the cut surface of the stock. The air-tightness of the contact surface would decide whether the union is successful or not. A long exposure of the cut surface of the scion must be kept during the operation, in a tall box to prevent its cut surface drying up The best kind of knife to use in mango grafting is one having a blade of stainless steel and sharpened on one side only. By using such a knife, oxidation of the surface can be prevented. The sharp edge of the knife must be straight so as not to cause any curvature on the cut surface. The best type of tying material is ordinary cotton string tape commonly used in the shop which is composed of several thread lines pasted flat in one narrow strip. The tape must be wound close and tight so as to exclude air. Such tape will be removed one or two months after the taking of the scion when it will have increased in volume. Waxed cloth tape generally used in budding is not satisfactory, as it prevents the quick swelling of the scion in action.

Treatment after operation. No cover is necessary to protect the graft even in strong sun-shine. After two weeks, the uppermost bud of the scion begins to swell. If it looks difficult to judge whether the graft was successful or not, observe at night with the use of a flashlight. The surviving scion looks lustrous and turgid. After the third week, the bud starts its initial growth. The internal activity of the living graft can be easily detected with the frequent visit of ants, seeking the sugary secretion of the new growth. At this time, the top of the root stock may also show new growth. These stock shoots must be shaved off with care as soon as they start to elongate. When the new growth of the scion develops and reaches a length of 30 cm. or so, the remaining top portion of the stock must be sawed off carefully at a point 5 to 8 mm. above the union.

If the scion did not take, the same stock can be worked again at the opposite side a little below the original incision.

Since no cover is used in the present method, precaution must be taken not to leave any wound of the scion in contact with the air. The success of the graft is therefore dependent upon the skill of the operator. Covering the grafted portion with soil helps injurious fungi or bacteria to the wound.

Discussion. Mr. Nakamura's side-working method of the mango is a good example of "soft wood grafting" which is generally believed unsuccessful in the tropics as well as in the colder countries. He found that the failure lies principally in the inadequate condition of the scion, and the lack of proper attention to safeguard its activity. The immature bud does not develop in most of the temperate species, except in a few, like the apple, plum, and the cherry. With most of the tropical species, however, it is easier to make such immature bud start growth, provided the forcing is done effectively. This can be attained by pre-curing the bud through defoliation and putting it into a vigorously growing stock during the active growing season, not in the springtime when the bud is semi-dormant. The strong seedling cut in summer or early fall can easily stimulate the inserted bud to growth, after a certain period of curing caused by the natural drop of the petiole which, in turn, is forced by the removal of the blade. At the same time the scion is almost water-proof as the petiole scar is already well coated with cork tissue thus preventing evaporation. All these factors favour the rapid healing of the union and the easy development of the new bud. At

the end of the fall, an already well developed nursery plant can be secured and a large number of similar plants will then be available as a good supply of the budwood can be had at intervals of approximately two weeks, as stated in the preceding paragraphs. The entire grafting work is complete at the end of the year the seeding of the stock plant is started and the resulting young plants are ready to be transplanted in the next spring. In this way standard varieties, like the *Carabao* and the *White Golek*, can be obtained in a large number within a very short time. This gives an opportunity to mango planters to raise more plants of the desirable variety with less expense and labour. This fact also suggests the possibility of the mango trees being planted on a large scale as a plantation crop, since the demand for fresh fruits has increased after the invention of preparing the frozen mango meat for use in ice-cream manufacture. The canning of the mango meat is also a great possibility in tropical countries. Fruits of such varieties like the *Carabao* and the *White Golek* can be picked green before the mango fruit fly (*Chaetodacus dorasalis*) Hendel has a chance to attack them. They can then be satisfactorily transported and marketed before they get overripe. It is hoped that the present paper may be of help in the future development of the mango industry in the Far East. *The Philippine Journal of Agriculture*, Vol. 10 No. 1, 1939.

Cotton Cultivation in Italy.

(Translated by N. K.)

The cultivation of cotton is confined to the warmest portions of Italy viz. Southern Italy and Sicily, which was once considered the main mine of "White gold" for Europe. In 1864 more than 88000 ha.[1] of land was under cotton, with a return of about 200,000 dz.[2] of lint. Owing to the competition from the tropical countries and the small encouragement from the then government the cultivation gradually fell down till ultimately it practically disappeared. About the beginning of the present century it was only 2000 ha. which rose during the war to 10,000 ha. In 1930 it went down again to 3361 ha. and in 1934 to 2958 ha.

The period from 1936 onwards saw a regeneration of the cultivation of this crop :—1936—9638 ha. with a yield of 18,580 dz. lint and 3760 dz. of seeds; 1937—23,681 ha. with 59,212 dz. lint and 17,602 dz. seeds ; and further the cultivation extended in Southern Italy from 11 provinces in 1930 to 24. It was calculated that in 1938 owing to the activities of the propoganda organistations, which are interested in all fibre plants, the extent of cotton cultivation to be at least 40,000 ha. In the last five years Italy has imported cotton to an extent of 2 million dz. which amounted in value to about 1-2 million Liras.

Varieties, climate and soils. Almost all the seeds sown in Italy are traceable to the crosses of *Gossypium herbaceum* X *G. barbense*. *G. arboreum* follows as the second and even as the third, while the *G. religiosa* is of no account in Italy.

The most widely spread and patented sort in Southern Italy is called "Acala". Then numerous other sorts : Nostrale di Terranova ; Nostrale di Sciacca ; Biancorizzo ; Biancavilla ; Bianco di Castellammare ; Gentile Maltese and hybrids with the Egyptian "Sakellaridis". But the long staple Egyptian varieties which are descended from the Sea-Island cottons are unfortunately of little importance on account of the unfavourable climatic conditions.

The experiences in the cotton cultivation from 1860 to 1865 have shown that this plant could be with advantage cultivated in Southern Italy. In Bulgaria itself this plant thrives very well and in Jugoslavia 64,000 ha. are set apart for this crop while in Greece the yearly cultivation runs to about 200,000 ha.

1. one hectare = 2·47 acres ; 2. one doppelzentner = 1 quintal or 2 cwts.

In Southern Italy regions from about 200 to 500 meters[1] above sea level and lying in advantageous positions are to be preferred for cotton. Under 200 m. it flourishes very well every where so long as it is not caught in the late frost. The best suited are the middle-heavy, alluvial soils, and experience has shown that this plant could be cultivated with a fairly good yield, in heavy, somewhat saline, and also on very light soils provided the suitable cultural methods are employed. Only very steep, stony and highly calcareous, very dry or water-logged soils are not fit for this crop.

Irrigation is not unavoidable. In Russia the land under cotton was increased five-fold in that a land which was not suitable for irrigation was also put under this crop.

From the 20,000 ha. which was under cotton in the year 1937 in Sicily only 3000 ha. could be irrigated. Certainly an irrigation in the dry spring season for ensuring the germination and towards the time of the first flowering would be very helpful. Excepting in the very light soils irrigation from August onward is injurious as it would prolong the ripening. The early ripening is very much wished for, for it has a very special importance, thereby the harvest would be ended within October, or at the latest in the first half of November thus making place for the wheat which follows it.

Preparation of the field. Cotton prefers a good well worked soil, which during the period of the crop must be harrowed three or four times to keep it free from weeds. Manuring: A good stable yard manure from 100—150 dz. per ha. is very good. Phosphoric acid (6—8 dz. superphosphate 16/18%) and potassium (100 to 200 Kg. of sulphate) should invariably be added, since these increase the yield and ginning percentage. P. improves the quality and improves what is very important—the ripening ; K. makes the plants resistant against diseases specially rust attack. N. should be used in very poor soils and always with great care.

In the case of the dry fields the manure should be ploughed in, in the early spring but in the irrigated fields it could be done a few months later.

Sowing. The time of sowing depends completely on the rain and the moisture conditions. In general it is conducted in rows 80—100 cms. apart. The seed rate is 15—18 Kg. per ha. from which only 2/3 is at first sown so that any gaps in the germination may be later filled up by the remainder.

The first weeding is soon after the germination and the second at the beginning of June when the seedlings have 6 to 8 leaves. During the further growth of the plants the soil must be periodically worked so as to keep out all weeds. Unwanted side branches must be removed and in the beginning of September the plants thinned out to promote the growth and ripening of the capsules.

The harvest begins 15 to 20 days after the opening of the first capsule and takes about a month's time. Normally three harvests are done, but 50% of the yield and also the most valuable portion of the crop is obtained in the first harvest. A higher price is paid for this, for from this the seed for the next season is reserved. Then follows still two further harvests and towards the end of Autumn latest in the second half of November, all such capsules that are not yet ripened are removed and dried in the sun or in ovens to induce the capsules to burst. But the lint obtained by this method is very poor.

Sicily produces in general the best lint (better than the one obtained in America from the same variety). They can be classified in the "good strict middling" group, when it is not spoilt through watering and careless harvesting.

The opinions as to the methods and quantity of manuring is divergent. Various workers, however, come to the conclusion that stable yard manure

1. 1 metre = about 3⅓ feet.

has got a good effect only when it is applied early enough and ploughed in, that N. as artificial manure may be used with special precautions and in calculated quantities and superphosphate and potassium sulphate give mostly good results in that they not only increase the produce but also improve the quality.

In order to extend the acreage under cotton an important research scheme has been laid down by the *Comitato Nazionale per l' incremento delle concinazioni* in Rome. This experiment will be tried in various important provinces particularly in Southern Italy and Sicily. *Die Ernaprung der Pflanze* 35 (1939) : 146.

EXTRACTS

A New Microscope. Prolonged tests have now proved that the super-microscope, recently demonstrated to the public of New York, is an instrument of immense practical value. There is every possibility that it may go down to history as the outstanding invention of the twentieth century. Tiny disease germs that are quite beyond the range of the ordinary optical microscope have been photographed with clarity and detail. The super-microscope has opened up an entirely new field in the science of bacteriology, and that is only one aspect of its usefulness.

The basic limit of the optical microscope was reached years ago, although minor inventions and ideas have improved it in certain specialised directions. The limit of the ordinary microscope is governed by the wave length of light, which is far too coarse for the purpose of investigating the world of the infinitely little. Light waves are about one fifty-thousandth of an inch long. The germ is small enough but there are many things much smaller. The germ that causes measles is a typical example; it cannot be identified by an optical microscope.

The new microscope uses electrons instead of light, and if there is anything smaller than an electron, science has yet to discover it. The idea of using electrons for detecting very minute bodies was talked about ten years ago but the method eluded the research workers until 1932 when Professor Ernst Ruska of Germany announced that he had invented a machine on paper. He began to build models to prove that his theories were correct. To-day his first working super-microscope is producing extraordinary results, and no doubt these will be regarded as crude and coarse when the new instrument has been perfected.

The apparatus looks more like a machine than an optical instrument. It stands higher than a tall man and gives the impression of a howitzer with knobs on. Inside the central metal tube a vacuum is maintained so that the electrons meet with no resistance as they go about their work. Air molecules would be too coarse a medium for the electrons to operate in. Attached to the tube is an instrument panel studded with dials and controls to enable the operator to keep in strict harness the 80,000 volts of electricity required to set up a stream of electrons.

The basic idea of the super-microscope is simple enough. A narrow beam of electrons is made to pass through the object being studied. The beam is then "coned" out to give an amplified image. In ordinary microscopes amplification is obtained by lenses which bend the light out of its natural path. Glass lenses are useless for electrons because glass is not transparent to them in the sense that it is to light. The super-microscope uses magnets and induction coils to establish electric fields of force at strategic points. These pull the narrow beam into a cone-shaped mass of flying electrons and at the base of the cone there is a screen on which the electrons impinge.

The beam of electrons shoot downwards, at nearly 100,000 miles a second, through a small aperture near the top of the machine. Magnetic fields ' waist " the beam to an incredibly small diameter at the point where the object under examination is placed. Let us suppose that a group of bacteria is being studied. Some of the electrons are stopped by the denser portions of the bacteria. Others pass unchecked through the more transparent parts. Once the beam, or what is left of it, has passed through the object, it is fanned out in all directions at once and equally. Eventually, the everwidening beam strikes a screen which is coated with a chemical capable of converting the impact of each electron into a point of light.

The observer looks through an eyepiece in the base of the machine and sees a televised half-tone incredibly magnified of the object under study. The super-microscope has already photographed bacteria 20,000 times larger than life, whereas the optical microscope's limit of magnification is 2,000 times larger than life. As a beginning this is no mean effort. Given sufficient capital it would be possible to build a super-microscope as tall as a skyscraper and with it to magnify germs to the size of elephants. Theoretically there is no limit to the degree of magnification possible.

All kinds of people will want to use the super-microscope. With its help textile experts will be able to devise new fabric and to improve existing ones. Metallurgists may discover in it the 'philosopher's stone' of the ancient alchemists, the magic instrument that will enable them to convert one metal into another by the simple process of re-arranging the atoms. Scientific detectives will unearth new sorts of clues with its aid. Even brewers may use it to study more closely the mystery of fermentation. Biologists need it badly for the study of genes, the infinitesimally tiny things that determine whether a person shall have brown hair, blue eyes, and so on. Genes are so small that a five-grain aspirin tablet would be large enough to contain all the genes necessary to determine the heredity of the next two million babies. Chemists need the super-microscope for the closer study of complex molecules, both for industrial and health purposes. The mystery of cancer may at last be probed by the new eyes. There are endless possibilities.

The electron microscope has its limitations. The optical instrument can study things alive and can often watch harmful bacteria at their fell work. The electron beam is a death-ray that kills anything left alive by the vacuum in which it works. This is not a serious handicap; the facts of an organism's life may perhaps be reconstructed by obtaining many photographs of it in death. In any case, the super-microscope taps a world that is largely below the scale of life as we understand it, that indeterminate field between the organic and the inorganic. However, the electron microscope will never be able to reveal the secret of life itself.

A new era. Intense interest has been aroused among scientists by the news that Dr. Vladimir Zworykin's new " ultra microscope," said to be capable of magnifying up to 1,000,000 times, has been demonstrated at Richmond, Virginia. There is certain to be considerable controversy about the nature of Dr. Zworykin's apparatus. Some students of microscopy hold that it is not a microscope at all. That question, and others concerned with Dr. Zworykin's claims, will be raised shortly at a special meeting of scientists in London.

" It is contemplated," Dr. Clarence Tierney, Secretary of the Royal Microscope Society, told an *Observer* representative recently, " that Dr. Zworykin's new apparatus shall be thoroughly discussed at a meeting of the society. It is difficult to make any definite statement until the matter has been thrashed out at that discussion."

Bacteria Seen. Dr. Zworykin's instrument uses electrons instead of light. The objects magnified are projected on a fluorescent screen. At the demonstration bacteria never revealed before were shown to a large audience of scientists and technicians.

Those who say that the apparatus is not a microscope point out that according to reports the images shown by it are not "resolute". They are more like the outlines thrown by a shadowgraph, or the objects revealed by X-ray photography.

To this others object that the apparatus is performing a function beyond the scope of any microscope. They argue that even if the ordinary microscope uses ultra-violet instead of ordinary light rays, it is limited to certain wave lengths. Nothing smaller than these light waves can be shown. In other words, the microscope, as we understand it, has reached the limit of its usefulness, or the limit of smallness in the forms of life which it can reveal.

Revolutionary Apparatus. Although it may not have the precision of the ordinary microscope, Dr. Zworykin's apparatus probably reveals, at any rate in outline, forms of life and energy which have not hitherto been visible at all. One of its uses, if it can show ordinary molecules with sufficient accuracy, may be to do away with the need for elaborate X-ray study of large and complicated molecules. Dr. Zworykin, Director of the Electronic Research Laboratory at Richmond, was closely associated with the invention of the television camera. Indeed, his new "ultra microscope" is allied technically to the ordinary television camera. The electrons emitted by the object to be studied are focused by a powerful magnetic field and the focused image, much magnified, is shown as in the television receiver on a fluorescent screen. (*Indian Forester*, Vol. 65 : (1939) 297—300.

Agricultural Jottings.

TIRUVOTTIYUR MILCH CATTLE MARKET

Tiruvottiyur, six miles to the north of Madras on the Madras—Waltair section of the M. & S. M. Railway, is the main market which supplies milch cattle to the City of Madras. The import of cows and milch buffaloes to this market ranges from 12,000 to 15,000 annually, and the daily average arrivals amount to four to five wagon-loads or 32 to 40 animals. Cows are brought from the Ongole breeding tract as well as from the contiguous taluks of Guntur and Nellore districts. These two districts supply also buffaloes. Practically all stations from Nellore to Tenali are booking animals but the important ones are Tanguturu, Ongole, Tenali and Singarayakonda.

Tiruvottiyur is a daily market and one can see about 250 animals assembled there in the slack season from March to August and about 400 in the busy season from September to February. Roughly a little more than half the number of cattle is cows chiefly of Ongole breed with a few cross-breds, and the rest are country buffaloes. Of late, Delhi (Murrah) buffaloes are coming to this market from the Punjab and Central India from July to December.

Milch cattle trade is in the hands of *dalaries* or cattle dealers, who go to the producers in the tract and purchase cows and buffaloes with calves at foot or those nearing parturition. Money is usually paid to the producer in cash but sometimes credit transctions also take place if the dealer is known. The dealer collects the animals to the nearest railway station and books them to Tiruvottiyur where he offers them for sale.

The market at Tiruvottiyur is a private one and the dealer is permitted to construct a shed at his own expense wherein he lives and no charge is made for it. The only charge he has to pay the market owner is Rs. 2—4—0 for a wagon-load of eight animals. The animals can be kept in this market till they are sold. Sales take place chiefly through brokers. If a purchaser wants a cow, the broker takes a rupee from the purchaser and pays it to the dealer which betokens the commencement of negotiations. The broker and the dealer then start bargaining. If the bargain falls through, the rupee is returned, but if it is concluded the purchaser has the option of revoking the bargain if the animal does not yield the specified quantity of milk at the purchaser's place. For this test, the purchaser has to pay a rupee to the dealer and another to the cooly to deliver the animal at the purchaser's place. In case, the animal is not up to the mark, it is returned and the purchaser loses three rupees paid in the transaction. If the animal is purchased the broker gets one rupee from the purchaser and from Rs. 5 to 10 from the dealer. The prices generally range from Rs. 100 to Rs. 150 for an average milking cow and from Rs. 150 to Rs. 200 for a good milking cow. Prices of buffaloes range from Rs. 80 to 120 and from Rs. 120 to Rs. 150 respectively. Poorer milkers are available at cheaper prices. Out of the prices realised at this market, it is computed that about 60 to 65 % goes to the producer ; the expenses under collection, transport, labour, market charges, feeding, brokerage etc. amount to about 20 % and the dealer's profit is 15 to 20 %.

Various concessions have been obtained for this trade from the Railway Company. The terminal charge of Rs. 4 per wagon at Tiruvottiyur has been removed. Railway freight for dry cows from the City to grazing areas has been reduced by 50%. This has reduced considerably the chances of dry cows falling into the hands of the butcher. Calves of dry cows were charged separately during the return journey till recently. But now they can be carried with the mother without any extra charge.

The market is very important to Madras City from the milk supply point of view. Hence market intelligence relating to supply, demand and prices is a great desideratum. The producer will know the prevailing price at Madras and thus dictate his own terms to the dealer. This will reduce the middleman's profit to the producer's advantage. Such news service is not available now for any cattle market and a start is being made with this market and it is hoped that weekly notes will be published hereafter.

Tiruvottiyur Milch Cattle Market.

Madras, Friday the 28th July 1939.

Arrivals and stock of country buffaloes are on the increase. Fine buffaloes of the Delhi breed are arriving. Trade in cows continues to be dull. Prices stationary.

The following gives the stock movements during the week ending 28th July 1939.

	Stock at commencement.	Arrivals.	Sales.	Balance at end.
Cows-Ongole	82	98	93	87
Cows-cross bred	2	...	...	2
Buffaloes-country	92	118	37	176
Buffaloes-Delhi	18	16	7	27

Prices :

Age.	Milk yield.	Prices from	to
1. *Cows-Ongole.*		Rs.	Rs.
1st and 2nd calving	2—3 Madras measures.	100	120
	3—4 ,, ,,	120	140
2nd and 3rd calving	2—3 ,, ,,	60	90
	3—4 ,, ,,	90	100
2. *Buffaloes-country.*			
1st and 2nd calving	2—3 ,, ,,	70	100
	3—4 ,, ,,	100	120
2nd and 3rd calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	80
3. *Others.*			
Buffaloes-Delhi		150	200
Cows cross-bred		150	200

1 Madras measure = 4 pounds.

Tiruvottiyur Milch Cattle Market.

Madras, Friday the 4th August 1939.

Owing to demand for milk, sales are improving, arrivals of Ongole cows are increasing, but not adequate ; whereas buffaloes are arriving in large numbers. Prices do not show any tendency to fluctuate.

The following gives the stock movements during the week ending 3rd August 1939.

	Stock at commencement.	Arrivals.	Sales.	Balance at end.
Cows-Ongole	87	86	103	70
Buffaloes-country	176	162	134	204
Buffaloes-Delhi	27	22	11	38

Prices :

Age.	Milk yield.	Prices from	to
1. *Cows-Ongole.*		Rs.	Rs.
1st and 2nd calving	2—3 Madras measures.	100	120
	3—4 ,, ,,	120	140
2nd and 3rd calving	2—3 ,, ,,	60	90
	3—4 ,, ,,	90	100
2. *Buffaloes-country.*			
1st and 2nd calving	2—3 ,, ,,	70	100
	3—4 ,, ,,	100	120
2nd and 3rd calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	80
3. *Others.*			
Buffaloes-Delhi		150	200

1 Madras measure = 4 lbs.

Correspondence.

To

The Editor, Madras Agricultural Journal.

Sir,

The use of cinema films for Agricultural propaganda.

The Government are spending much on motor exhibition vans of the Health, Veterinary and Agricultural departments. When the vans are on tour, there is the expenditure of (1) pay and travelling allowances of the driver and the messenger (2) tax on permits (3) cleaning and repairing charges (4) petrol and

lubricating oils (5) wear and tear etc. Moreover the tour programmes of these vans cannot always be adhered to owing to some trouble or other. I suggest the following alternative to propaganda by travelling vans.

At the present day for every 10 miles or thereabouts there are one or two touring cinemas and in some villages the Government have installed radio sets. Is it not possible for Government to show departmental propaganda films in these cinemas?

The officers of all these departments who are already provided with magic lanterns, can continue to hold lantern lectures and shows in interior villages. By abolishing these motor exhibition vans, the Government can save a few thousands of rupees and this amount can be utilised for 'shooting' suitable subjects for propaganda.

Chandragiri, 26—7—1939.

Yours &c.,
C. Kesaviah Naidu.

To

The Editor, Madras Agricultural Journal.

Sir,

Indian Science Congress—Madras Session.

The twenty-seventh annual meeting of the Indian Science Congress will be held in Madras from the 2nd to the 8th January 1940. Members of the Madras Agricultural Students' Union, Officers of the Agricultural Department and others interested in Agricultural Sciences are requested to contribute papers of scientific interest to be read during the session.

Papers submitted for reading at the session can only be submitted by Ordinary and Full session members or through Ordinary members. Papers are not admissible for reading at the session by any one who has not been enrolled as a member by the 15th September 1939. If any one proposes to read a paper it should be forwarded together with three copies of an abstract so as to reach the General Secretary mentioning the Section before which the paper is intended to be read, not later than 15th September 1939 for submission to the Sectional Committee. Abstracts should be typewritten and must not exceed 200 words. They should not include formulae or diagrams. No abstracts will be printed unless accompanied by the full paper at the time of submission. Not more than ten minutes will be allowed for the reading of any paper. All correspondence on the matter should be addressed to local Secretaries of the Indian Science Congress, Madras Session, University Research Laboratory, Chepauk, Madras.

There are three classes of session members:—

(a) Full session members—subscription Rs. 10 per session.
(b) Associate session members—subscription Rs. 5 per session.
(c) Student session members—subscription Rs. 2 per session.

Yours &c.,
K. T. Alwa,
Secretary, Agricultural Section.

Chepauk, Madras. 21st, August 1939.

Crop and Trade Reports.

Statistics—Crop—Sugarcane—1939—First report. The average of the areas under sugarcane in the Madras province during the five years ending 1937-38 has represented 2·8 per cent. of the total area under sugarcane in India.

The area under sugarcane up to 25th July 1939 is estimated at 102,910 acres. When compared with the area of 75,720 acres estimated for the corresponding period of last year, it reveals an increase of 35·9 per cent. The increase in area occurs in most districts and is due to the recent high price of jaggery.

The condition of the crop is generally satisfactory except in South Arcot where it was damaged by the shoot borers to some extent.

The wholesale price of jaggery per imperial maund of 82$\frac{2}{7}$ lb. (equivalent to 3,200 tolas) as reported from important markets on 9th August 1939 was Rs. 9-14-0 in Adoni, Rs. 7—9—0 in Rajahmundry, Rs. 7—7—0 in Mangalore, Rs. 7—6—0 in Cocanada, Rs. 7—5—0 in Vizagapatam, Rs. 7—4—0 in Salem, Rs 7-3-0 in Chittoor, Rs. 6—15—0 in Vellore, Rs. 6—12—0 in Cuddalore, Rs. 6—10—0 in Vizianagaram, Rs. 6—7—0 in Erode, Rs. 6—6—0 in Bellary and Rs. 6-0-0 in Trichinopoly. When compared with the prices published in the forecast report issued at this time last year, these prices reveal a rise of 83 per cent. in Cuddalore, 62 per cent in Bellary, 56 per cent. in Adoni, 48 per cent. in Vizagapatam, 47 per cent. in Salem, 38 per cent. in Vizianagaram, 36 per cent. in Cocanada, 26 per cent. in Rajahmundry, 24 per cent. in Erode, 13 per cent. in Trichinopoly, 8 per cent. in Vellore, 5 per cent. in Chittoor and 1 per cent. in Mangalore.

Statistics—Gingelly—1939—40—*First forecast report.* The average of the areas under gingelly in the Madras Province during the five years ending 1937—1938 has represented 15·6 per cent. of the total area under gingelly in India.

The area under gingelly up to 25th July 1939 is estimated at 366,100 acres. When compared with the area of 338,900 acres estimated for the corresponding period of last year, it reveals an increase of 8·0 per cent. There has been a large increase in area in Chingleput, South Arcot, North Arcot, Salem and Coimbatore, which has been partly counterbalanced by a large decrease in area in Vizagapatam, East Godavari and West Godavari.

Yield. The yield is expected to be below normal in Vizagapatam, Chingleput, North Arcot, Coimbatore and Trichinopoly.

The wholesale price of gingelly per imperial maund of 82$\frac{2}{7}$ lb. (equivalent to 3,200 tolas) as reported from important markets on 7th August 1939 was Rs. 6-8-0 in Cocanada, Rs. 6—6—0 in Rajahmundry, Rs. 6—4—0 in Tinnevelly, Rs. 6—0—0 in Vizianagaram and Tuticorin, Rs. 5—15—0 in Ellore, Rs. 5—14—0 in Vizagapatam, Rs. 5—11—0 in Cuddalore, Rs. 5—7—0 in Trichinopoly and Rs. 4—8—0 in Salem. When compared with the prices published in the report for the corresponding period of the previous year, i. e., those which prevailed on 8th August 1938, these prices reveal a rise of approximately 21 per cent. in Vizagapatam, 17 per cent. in Vizianagaram, 16 per cent. in Tinnevelly, 14 per cent. in Ellore, 13 per cent. in Cocanada, 12 per cent. in Rajahmundry and 5 per cent. in Tuticorin and a fall of 9 per cent. in Salem and 16 per cent. in Trichinopoly, the price remaining stationary in Cuddalore.

Statistics—Groundnut—1939—Second report. *Summer crop—Area and Yield.* The area under the summer or irrigated crop of groundnut in parts of the Madras Province during the five months—January to May 1939—is estimated at 75,500 acres When compared with the area of 82,500 acres estimated for the corresponding period of last year, it reveals a decrease of 8·5 per cent. The crop has been harvested in most districts. The yield is expected to be normal only in Anantapur and Cuddapah and below normal in other districts on account of insufficient rains. The total yield is estimated at 57,600 tons of unshelled nuts as against, 72,500 tons estimated for the corresponding period of last year.

Early crop—Area and yield. The area under the early crop of groundnut (mostly unirrigated) up to 25th July 1938 in the districts of Salem and Coimbatore, is estimated at 142,000 acres. When compared with the area of 146,000 acres estimated for the corresponding period of last year, it reveals a decrease of 2·7 per cent. A normal crop is reported from Salem. The crop in Coimbatore has been affected by drought to some extent. The total yield is estimated at 66,200 tons of unshelled nuts as against 67,700 tons estimated for the corresponding period of last year.

The wholesale price of groundnut (shelled) per imperial maund of 82$\frac{2}{7}$ lb. (equivalent to 3,200 tolas) as reported from important markets on 7th August 1939 was Rs. 5—0—0 in Cuddalore, Rs. 4—9—0 in Vizagapatam, Rs. 4—8—0 in Vizianagaram, Rs. 4—4—0 in Guntur, Rs. 4—3—0 in Cuddapah and Vellore, Rs. 4—1—0 in Tadpatri, Rs. 4—0—0 in Nandyal, Rs. 3—14—0 in Bellary and Hindupur and Rs. 3—12—0 in Adoni and Anantapur. When compared with the prices published in the last report, i. e., those which prevailed on 10th July 1939, these prices reveal a rise of 2 per cent. in Nandyal and Hindupur and a fall of 7 per cent. in Guntur, 4 per cent. in Vizagapatam, 3 per cent. in Adoni and 2 per cent. in Tadpatri, the prices remaining stationary in Vizianagaram, Bellary, Cuddapah, Cuddalore, Vellore and Anantapur. *(From the Director of Industries and Commerce).*

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 18th August 1939 amounted to 3,86,958 bales of 400 lb. lint as against an estimate of 388,900 bales of the total crop of 1938—39. The receipts in the corresponding period of the previous year were 3,91,590 bales. 3,04 151 bales mainly of pressed cotton were received at spinning mills and 1,62,290 bales were exported by sea while 1,17,407 bales were imported by sea mainly from Karachi, Bombay and Egypt.

(From the Director of Agriculture).

College News and Notes.

Students' Corner—*Students' Club. Welcome to freshers*—The students of the second and third year classes welcomed the students of the first year B. Sc. class and the short course, on the 26th July. The function began with tea and was followed by music. The Principal's speech welcoming the students to the college was followed by speeches from the lecturers, tutors and coaches. To the cordial welcome extended by the representatives of classes II and III, the representative of class I and short course made a suitable reply.

A Debate. A debate that in the opinion of the house "political reform should precede social reform" was held on the 7th instant in the Freeman hall with Mr. G. V. Chellappa, student president in the chair. Mr. Muhammad Sulaiman of class III spoke for the proposition and Mr. S. N. Ramasubramanian of class II led the opposition. Mr. R. C. Broadfoot was the observer. A large number of students and other members took part in the discussions and the proposition, when put to vote was carried by a large majority.

An address. At a meeting of the students' club held on the 15th instant in the Freeman hall, Mr. M. S. Sundareswaran, M. A., L. T., Headmaster of the Wardha Education School, Coimbatore, delivered an interesting and instructive address on "Wardha scheme of education" to a packed gathering of students, officers, residents of the estate and a number of ladies and women teachers of the local Government training school. Mr. Md. Sulaiman, student presided. In a beautiful speech, which held the audience engaged for nearly two hours, the learned lecturer, pointed out, *inter alia*, the defects of the present system of education and explained the feasibility of introducing the Wardha scheme to suit the psychology of the child. On behalf of the students and other members of the gathering, a purse of Rs. 68—14—0 was presented to Mr. Sundareswaran towards the feeding and maintenance of the poor school children, at the Wardha school newly opened by the Government in the old Forest college buildings.

Games. *Cricket.* The cricket season has begun. The activities of the college team are in full swing. In a match played on the 29th of July against the local Government college team, our team put up a total score of 144 (Padbhanabhan 5 for 50) against a total of 66 of the Govt. college (S. V. Srinivasan 5 for 25). A feature of this match was the century (109) scored by S. V. Srinivasan who incidentally made the maiden century of his career.

A friendly match was played on the 30th July between the Officers' XI and the Students XI. The Officers were all out for 193, (K. K. R. Menon 42, C. N. Babu 69, K. Sanjiva Shetty 22, Somanna 2 for 42, S. V. Srinivasan 2 for 52, Radakrishnan 2 for 30). The students were all out for 149 (M. R. M. Punja 73 which included 10 boundaries), K. M. Somanna 21, and Mohinuddin 33).

Rhondy Shield. The first of the match of the series was played on the 5th instant between the Agricultural college B team and the Govt. college, in which our team was defeated,—the score being Govt. college—218 all out (Padbhanabhan 44, Srikant 35, Natesan 36—Ayyappa 3 for 27, Mukundan 3 for 48). The Agrl. Coll. B. team scored 89 all out—M. R. M. Punja being the top scorer 32 not out (Padbhanabhan 5 for 26).

In the second match of this series the Agricultural college A team beat the S. R. C. A team by a big margin. The College A Team put in a total of 225 for 4 and declared before lunch. (C. N. Babu 92, H. Shiva Rao 72 (retired) and K. K. R. Menon 43). The S. R. C. were all out for 89 (Narasimham 40, Hornby 19, S. V. Srinivasan 5 for 28 and Kodandaraman 4 for 34).

The Palghat 'Victoria College' came over to Coimbatore and played a friendly match with the Agricultural College on the 20th instant. The home team batting first were all out for 131 (S. V. Srinivasan 23, Mohinuddin 21. Sankar Rao 21, Madhavan 2 for 35). The visitors were dismissed for 76, (Madhavan 36, S. V. Srinivasan 4 for 24, Somanna 3 for 9 and Shankar Rau 2 for 11),

The Agricultural A and B teams, met in a fixture on the 12th instant, in which the former team won. The A team put up a total of 188 (K. K. R. Menon 42, S. V. Srinivasan 47, Ayyappa 3 for 16, Radhakrishnan 2 for 37. The B team gathered a total of 100 (Narayana Kamath 22, Shankar Rao 23 not out, S. V. Srinivasan 4 for 49, Kothandaraman 4 for 27).

Tennis. A fourth tennis court was opened by Mr. R. C. Broadfoot, Principal on the 1st instant. This has satisfied a longfelt need of the students' club. An exhibition match was played on the 2nd instant in which Messers C. Ramaswamy, M. V. Bobjee and Choudiah participated.

Football. The college eleven played the local Municipal High School on the 4th instant which ended in a draw of 3 goals all. In two fixtures against the officers' XI, the students won the first at 3--0 and lost the second 0—1.

Hockey. The College XI met the Students' Union Club, Coimbatore on the 28th July in a friendly match and lost by 2 goals to nil. The match against the police recruits school ended in a win for our team by 3 goals to nil. A match was played against the officers' XI on the 14th instant in which the students won by a narrow margin. In an exciting match played on the 17th instant against the Crescents XI, our team was defeated by one goal to nil.

Personal. We are glad to record that Mr. C. Ramaswamy who was on the staff of the agricultural college and is now Deputy Director of Agriculture, Coimbatore, has been chosen as one of the three members (Selection Board) for the selection of the All India cricket XI against the English team touring India during the next cold weather. We offer our felicitations to him on this recognition.

Officers' club. In the World Bridge Olympic championship for 1939 held in April last, Messrs. M. S. Kylasam and T. S. Ramasubramanian of the Agricultural College Officers' Club have been declared to be the winners among the North-South pair for the whole of India and have thus won a most coveted bridge trophy. We heartily congratulate the winners on this great distinction.

M. Sc. Degree. The degree of M. Sc. has been conferred on Mr. T. Venkataramana Reddy, B. Sc. Ag., Assistant in Millets by the Madras University for his thesis on "Genetic studies in the seedling colours of sorghum". We congratulate Mr. Reddy on his success.

Ladies' Club. The building of the Agricultural College Ladies' Club which has been a place of recreation for the ladies of the estate during the last 12 years has been recently electrified. The Hon. Mr. V. I. Muniswamy Pillai, Minister for Agriculture switched on the lights on the 31st of July before an imposing gathering of ladies and gentlemen of the estate. The energetic secretary of the Ladies' Club, Mrs. J. David deserves to be specially congratulated for expediting the electrification of the club building.

Visitors. Messrs R. W. Littlewood and Kerr were here during the second week of the month for the purpose of inspecting the Dairy cattle of the central farm.

Weather Review—JULY 1939.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	6.5	-0.4	12.6
	Calingapatam	5.6	+0.3	11.3
	Vizagapatam	5.1	+0.6	9.9
	Anakapalli*	4.2	-0.9	8.2
	Samalkota*			
	Maruteru*	6.3	-1.2	8.9
	Cocanada	5.2	-0.6	11.9
	Masulipatam	4.0	-2.4	8.6
	Guntur*	4.8	-1.1	7.9
Ceded Dists.	Kurnool	2.3	-2.5	5.0
	Nandyal*	0.0	0.0	0.0
	Hagari*	2.1	+0.3	4.7
	Siruguppa*	3.1	0.0	4.5
	Bellary	1.2	-0.6	4.3
	Anantapur	0.7	-2.7	6.6
	Rentachintala	4.3	...	7.7
	Cuddapah	2.0	-1.9	6.1
	Anantharajupet*	2.5	-2.5	10.3
Carnatic	Nellore	2.6	-0.2	6.9
	Madras	1.4	-2.5	8.6
	Palur*	0.8	-1.9	13.8
	Tindivanam*	0.7	-1.1	10.0
	Cuddalore	0.7	-2.4	16.9
Central	Vellore	1.7	-3.6	11.8
	Salem	2.3	-1.5	17.5
	Coimbatore	0.9	-0.6	5.8
	Coimbatore A. C. & R. I.*	1.3	0.0	5.7
	Trichinopoly	0.1	-1.5	14.6

Division	Station	Actual for month	Departure from normal @	Total since January 1st
South	Negapatam	0.3	-1.6	18.3
	Aduthurai*	0.0	-1.3	16.4
	Madura	0.0	-1.9	14.8
	Pamban	0.0	-0.6	8.3
	Koilpatti*	0.0	0.0	0.0
	Palamkottah	0.0	-1.1	5.0
West Coast	Trivandrum	8.0	+0.6	36.1
	Cochin	22.3	-0.5	85.5
	Calicut	34.3	+4.2	78.0
	Pattambi*	28.5	+2.9	61.5
	Taliparamba*	45.92	+1.0	84.7
	Kasargode*	35.6	-6.7	80.5
	Nileshwar*	39.4	-3.1	71.9
	Mangalore	37.3	+0.2	79.5
Mysore and Coorg	Chitaldrug	3.4	+0.3	11.9
	Bangalore	2.4	-2.0	14.8
	Mysore	1.0	-1.6	11.6
	Mercara	37.0	-9.9	52.8
Hills	Kodaikanal	1.5	-3.5	21.5
	Coonoor			
	Ootacamund*	6.0	+0.1	21.4
	Nanjanad*	7.9	-2.9	19.2

*Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 published in the Fort St. George Gazette.

The monsoon was active during the month. It caused general rain in the Konkan, Malabar, Mysore, Bombay, Deccan and N. Hyderabad; and local showers in the Madras Deccan, South Hyderabad and North Madras Coast.

Four depressions of the Bay of Bengal were responsible for wide-spread rainfall. Skies were moderately to heavily clouded along the west coast, Bombay,

Deccan, Mysore and North Hyderabad and lightly to moderately clouded elsewhere. Humidity was in excess in all places except the extreme south of the peninsula where it was normal and in South East Madras where it was in defect. Maximum temperatures were below normal in the Konkan, Mysore, South East Madras, Madras Deccan and North Madras Coast. The highest maximum recorded was 101°F on the 29th at Madura, Trichy and Nellore.

The rainfall however was in defect generally except in parts of the West Coast.

The chief falls of rain were:—

Pattambi	...	3·3″
Nileshwar	...	3·6″
Mangalore	...	4·4″ on the 13th.
Calicut	...	4·5″ on the 15th.
Taliparamba	...	5·3″.

Weather Report for Agricultural College and Research Institute Observatory:

Report No. 7/39.

Absolute maximum in shade	...	91·0°F.
Absolute minimum in shade	...	70·0°F.
Mean maximum in shade	...	86·3°F.
Departure from normal	...	−0·8°F.
Mean minimum in shade	...	72·7°F.
Departure from normal	...	+0·7°F.
Total rainfall for the month	...	1·3″
Departure from normal	...	nil.
Heaviest fall in 24 hours	...	0·7″ on the 15th.
Number of rainy days	...	3
Mean daily wind velocity	...	7·8 m. p. h.
Departure from normal	...	+0·8 m. p. h.
Mean humidity at 8 hours	...	67·1%
Departure from normal	...	−6·9%

Summary. The monsoon was active during the month, and 1·3 inches of rain were received of which 0·7 inch was received on the 15th. The rainfall was just normal. Skies were moderately to heavily clouded and the humidity was in defect. The mean maximum was slightly below normal and the mean minimum was slightly above normal.

P. V. R. & F. L. D.

Departmental Notifications.

Gazette Notifications.

1. Appointments.

Sri. R. N. K. Sundaram, Assistant Director of Agriculture, Nellore is appointed to officiate as Deputy Director of Agriculture in Category 4 Class I, Madras Agricultural Service and is posted to III Circle, Trichinopoly *vice* Sri Y. G. Krishna Rao Nayudu transferred.

Sri. L. Narasimha Acharya, Agricultural Demonstrator, Chittoor is appointed to officiate as Assistant Director of Agriculture in Category 6–Class I Madras Agricultural Service and is posted to Nellore vice Sri. R. N. K Sundaram on other duty.

Sri R. Balasubrahmanya Ayyar, Assistant, Cotton Section, Guntur is appointed to officiate as Gazetted Assistant Mungari Cotton Breeding Station, Adoni in Category 8–Class I Madras Agricultural Service—with effect from the afternoon of 6th July 1939 vice Sri. V. K. Subrahmanya Mudaliar granted leave.

2. Transfers.

Name of officers.	From	To
Sri. Y. G. Krishna Rao Nayudu,	Offg. Dy. D. A., III Circle, Trichinopoly.	Offg. Dy. D. A., I Circle, Cocanada.

3. Leave.

Name of officers.	Period of leave.
Sri. A. Chinnathambi Pillai, Offg. Asst., D. A., Madura.	L. a. p. for 2 months and 15 days from 17–6–39.
,, B. Ramiah, Dy. D. A., I Circle, Cocanada.	L. a. p. for four months from the date of relief.
,, A. Ramaswami Ayyar, Offg. Supdt., A. R. S. Anakapalle.	L. a. p. for two months from date of relief.

Subordinates Services.

1. Appointments.

Sri. D. Viswanatha Reddi, M. A., (Madras), B. Sc. in Agriculture (Edin) is appointed as Upper subordinate, Agricultural section I Grade-on probation on Rs. 145 in the new revised scale of Rs. 145–15/2–190 in an existing permanent vacancy from 1st August 1939 and is posted to Central farm, Coimbatore.

Mr. Herbert A. Adiseshaiah, B. Sc. Ag. is appointed to officiate as upper Subordinate, Agricultural section, III grade on Rs. 75 in the new revised scale of pay on Rs. 75–7½/2–105 in Category I Class I, Madras Agricultural Subordinate service, Vice Sri. M. Subbaiah Pillai on other duty, and is posted to IV Circle, for work in the Tirupattur division.

Sri. P. K. Natesa Ayyar, B. A., B. Sc. Ag. Farm Manager, Central farm, on Rs. 120 in the old scale of Rs. 85–5–120 is appointed to the post of Agricultural Demonstrator in the new III grade temporarily for a period of 9 months from 10th July 1939 for work in the new School opened at Coimbatore for training of teachers in the Wardha Scheme of Education,

2. Transfers.

Name of officers.	From	To
Janab K. Soopi Haji Sahib,	Asst, A. D., Badagara	Off. Asst., F. M., Sim's Park, Coonoor,
Sri E. Achyutan Nayar,	Asst. A. D., Kallakuruchi	Asst. A, D., Badagara.
,, K. L. Ramakrishna Rao,	Cotton Asst. (on leave)	A. D., Ponneri.
,, C. Vadamalai,	A. D., Hindupur (on leave)	A. D., Vayalpad.
,, V. Kumaraswami,	A. D., Vayalpad	F. M. A. R. S., Nandyal.
,, S. Bhima Raju,	A. D. (on leave)	A. D., Chandragiri.
,, S. Muthuswami Iyer,	A. D. (on leave)	A. D., Madurantakam.
,, S. Krishna Naik,	A. D., Mangalore	A. D., Kasargode.
,, K. G. S. Bhandari,	A. D., Tirupur	A. D., Mangalore.
,, M. Subramania Pillai,	A. D., Erode	A, D, Tirupur.
,, K. Ramaswami Iyer,	A. D. (on leave)	A. D., Erode.

„ M. A. Balakrishna Ayyar,	A. D., Vellore	A. D., Wallajah.
„ M. Alagiriswami,	Asst. A. D., Wallajah	A. D., Tiruvannamalai.
„ K. E. Viswam Ayyar,	Asst. A. D., Tiruvannamalai	A. D., Wandiwash.
„ M. Obaidullah Shah,	A. D., Wandiwash	A. D., Vellore.
„ A Subba Rao,	A. D., Siruguppa	Sugarcane Growers' Co-operative Union, Hospet.
„ A. R. Krishnamurthy,	Asst. A. D., Orthanad	A. A. D., Karur.
„ K. S. Kuttimudali,	A. D., under training, Devakottah	A. D., Othanad.
„ K. Krishnan,	Livestock section	A. D., Cheyyar,
Janab Mohammad Abbas Sahib,	A. D., Cheyyar	A. D., Gudiyatam.
„ S. Khadir Rasack Sahib,	A. D., under training, Proddatur	A. D., Koilkuntla.
„ Shaik Hussain Sahib,	A. D., under training, Cuddapah	A. D., Atmakur.
Sri P. Ramanadha Rao,	A. D , Atmakur	A. D., Masulipatam.
„ P. Sudarsanam Nayudu,	A. D., Masulipatam	Madanapalle.
„ D. Shanmugasundaram,	A D., Periyakulam	A. D., Aruppukottai.
„ T. V. Ayyaswami Ayyar,	Asst. A. D., Aruppukottai	A. D., Ariyalur.
„ Annaswami Ayyar,	A. D. (on leave)	A. D., Giddalore.
„ C. Annamalai,	A. D., Madanapalle	A. D., Tiruttanni.
Janab Muhamad Obaidulla Shah,	A. D., Wandiwash	A. D., Periakulam.
„ Shaik Hussain Saheb,	A. D., undergoing at dist. work at Cuddapah	A. D., Pathikonda.
Sri B. Ramakrishna Reddy,	A. D., Pathikonda	A. D., Atmakur

Leave.

Name of officers.	Period of leave.
Sri V. G. Venkataramana Rao, A. D., (on leave)	Extension of earned leave for 1 month and 15 days from 1—7—39.
„ D. Hanumantha Rao, A. D., (on leave)	Extension of leave a. p. on m. c. for 15 days from 9—7—39.
„ S. Bhima Raju, A. D., (on leave).	Extension of l. a. p. for 14 days on m. c. 18—7—39.
„ S. P. Fernando, Asst. A. D., Harur	Extension of l. a. p. for 3 weeks from from 22—7—39.
„ K. Govindan Nambiar, F. M., Taliparamba	L. a. p. for 4 months from 17—7—39.
„ P. Gopalakrishnan, F. M., A. R. S., Koilpatti	Leave on half average pay for 1 month on m. c. from 6—7—39.
„ K. S. Ramana Rai, A. D., Moodbidri	L. a. p. for 15 days from 2—8—39.
„ R. Govindaramayya, A. D., (on leave)	Extension of l. a. p. for 15 days from 6—8—39.
„ N. Parthasarathi, Asst. in Paddy. Coimbatore	L. a. p. for 15 days from 4—8—39.
„ T. Varahalu, Asst. in Chemistry	L. a. p. for 15 days from 31—7—39.
„ Y. Venkataswami Rao, Asst. A. D., Bapatla	L. a. p. for 1 month from 1—8—39.
„ M. K. Gopalan, A. D., Proddatur	Extension of l. a. p. for 13 days from 8—7—39.

„ K. V. Seshagiri Rao, Asst. A. D., Atmakur	Extension of l. a. p. on m. c. for 2 months from 8—7—39.
„ E. K. Govindan Nambiar, F. M., Taliparamba	L. a. p. for 15 days on m. c. from 3—8—39.
„ C. Jagannatha Rao, Asst. in Cotton, A. R. S., Nandyal	L. a. p. for 1 month and 2 days from 1—8—39.
„ R. Alagiamanavalan, A. D., Punganur	L. a. p. for 1 month from 3—8—39.
„ C. S. Balasubrahmanyam, Asst. in Entomology (on leave)	Extension of L. a. p. for 14 days from 28—7—39.
„ C. Ranganatha Swami, F. M., A. R. S., Anakapalli	L. a. p. on m. c. for 3 months from 26—7—39.
„ T. S. Dakshinamurthi, A. D., Adoni	L. a. p. for 1 month from 8—8—39.
„ C. S. Gopalaswami Rao, Asst. in Mycology undergoing training in Entomology	L. a. p. for 4 months from the date of relief.
„ R. Krishnamurthy, Cotton Asst., A. R. S., Nandyal	L. a. p. for 2 months from 12—8—39.
„ M. V. Narasimha Sastri, Asst. A. D., Nandigama	L. a. p. for 4 months from 15—8—39.
„ T. Varahalu, Asst. in Chemistry, Coimbatore	Extension of l. a. p. for 15 days from 15—8—39.
„ Shivashanker Rao Gangolly, Taxonomical Asst. Fr. R. S., Kodur	Extension of l. a. p. for 19 days from 13—8—39.
„ C. S. Balasubrahmanyam, Asst. Entomology, Cuddapah	Extension of l. a. p. for 1 week from 11—7—39.
„ N. Annaswami, A. D, (on leave)	Extension of l. a. p. for 1 month from 25—8—39.
„ P. Ramanadha Rao, A. D., Atmakur	Earned leave for 15 days from 17-8-39.
„ M. S. Subbiah, Asst. in Entomology, Tinnevelly	L. a. p. for 2 months from 10-8-39.
„ K. Venkataswami, A. D., Palladam	L. a. p. for 1 month from 23-8-39.
„ K. M. Krishna Menon, Offg Asst. in Chemistry	L. a. p. for 1 month from 21-8-39.

Agricultural College and Research Institute, Coimbatore.

Additions to the Library during July 1939.

A. Books.

1. *Plant Injection for Diagnostic and Curative purposes* (*Imp. Bur. Horti. and Plant Crops-Tech. Commn. 10*). Roach, W. A. (1938). 2. *The Genetics of Cotton.* Harland, S. C. (1939). 3. Varietal Cotton Map of India (based on the Revised Trade Classification, 1939). 4. *Uses of Lac.* Sen, H. K. & Ranganathan, S. (1939). 5. *A Text Book of Zoology (for Intermediate class).* John, C. (1938). 6. *An Orientation in Science.* Watkeys, C. W. *Ed.* (1938). 7. *The Wardha Scheme of Education: Exposition and Examination.* Varkey, C. J. (1939). 8. *Hand book of the School of Agriculture, Cambridge University.* (1938). 9. *The African and the Cinema Bantu Educational Cinema Equipment.* Notcutt, L. A. and Latham, G. C. (1937). 10. *Ground work of Economics.* Richars, R. D. (1938). 11. *Notes on Statistical Mapping with reference to Population phenomena.* Wright, J. K. *et al.* (1938). 12. *Mechanical Training: A Book of Instructions for use in Schools and Colleges.* Boss, W. *et al.* (1938).

B. Administration Reports.

1. Travancore Agricultural Department Annual Report for 1937-38. 2 Hyderabad (H. E. H. Nizam's State) Agricultural Department Annual Report for 1935-36. 3. Ceylon Tea Research Institute Annual Report for 1938. 4. Uganda Protectorate Agricultural Department Part II—Subordinate Officers' Report for 1937-38. 5. Imperial Economic Committee Annual Report for 1937-38. 6. Pennsylvania Agricultural Experiment Station Annual Report for 1937-38. 7. Texas Agricultural Experiment Station Annual Report for 1937.

C. Proceedings & Conferences.

1. Travancore Board of Agriculture-Third Meeting, 1938, 2. International Conference of Agricultural Economists-5th Proceedings-1938. 3. Soil Science Society of America-3rd Proceedings-1938.

D. New Periodicals.

1. International Bibliography of Agricultural Economics. 4-8-39.